THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXIV. No. 1636.] LONDON, SEPTEMBER 18, 1894. [46TH YEAR. PRICE 6d.

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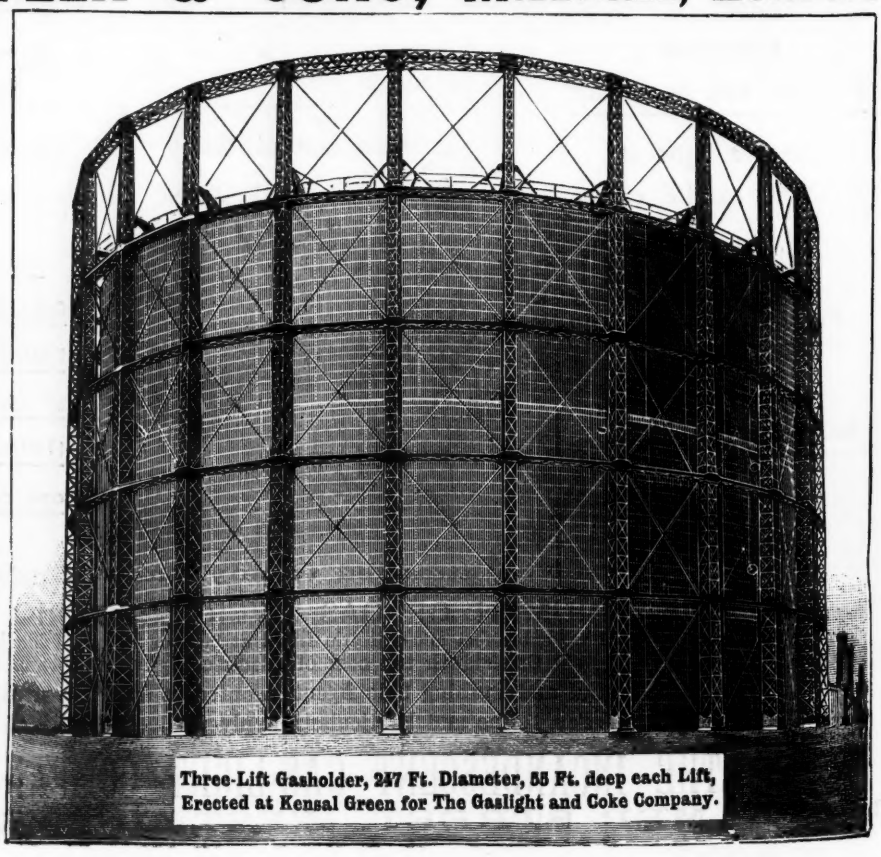

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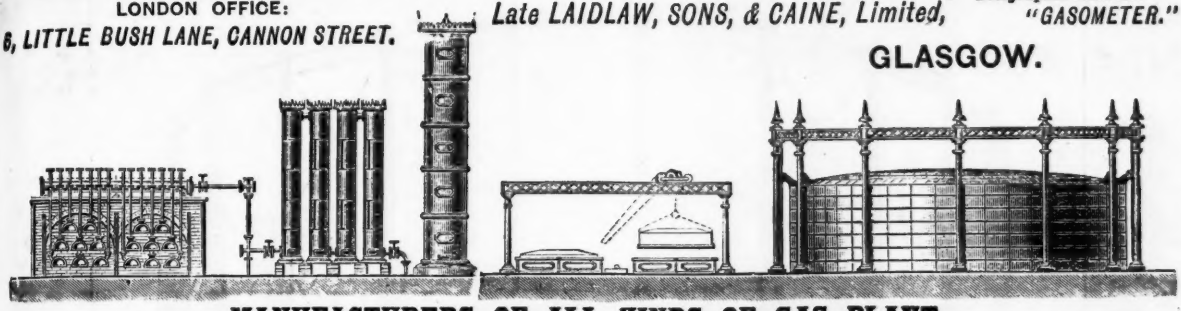

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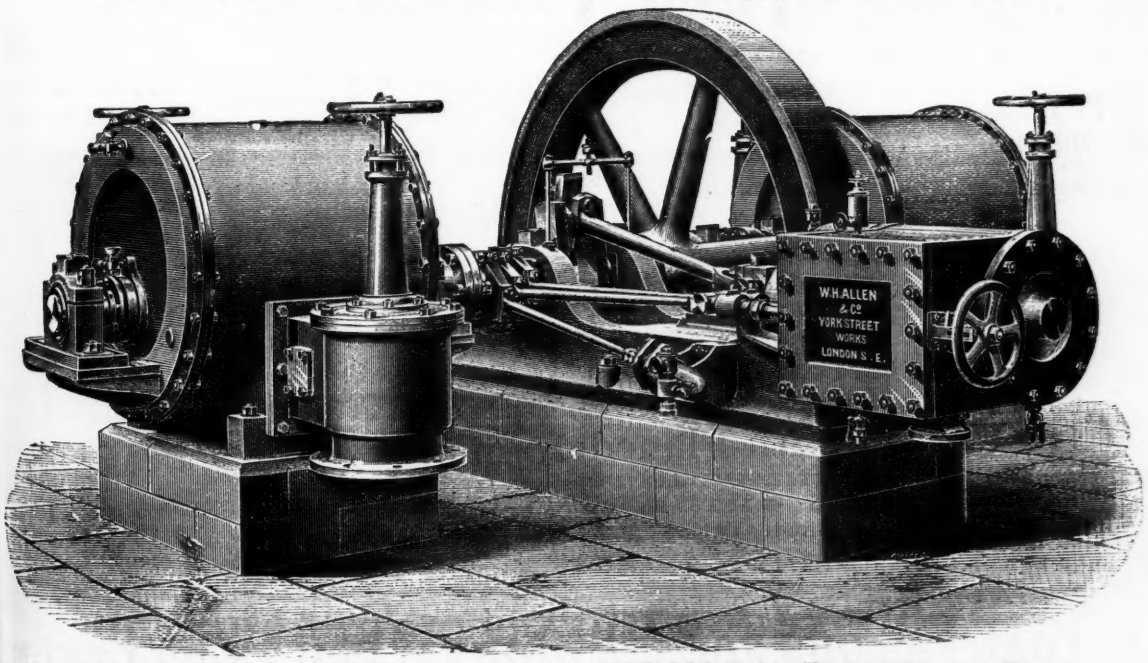

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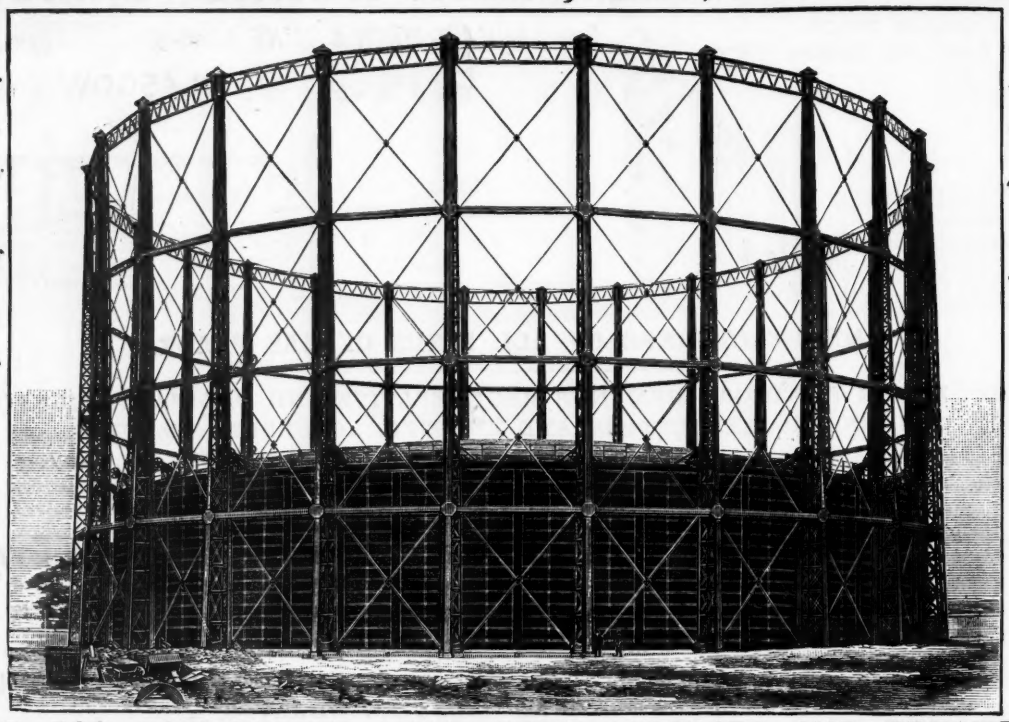

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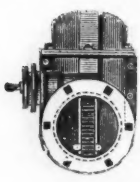

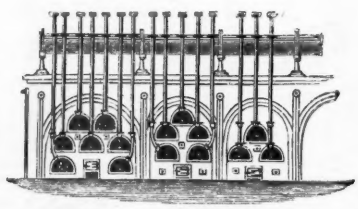

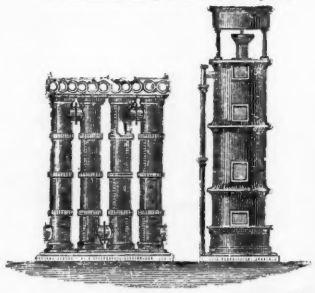

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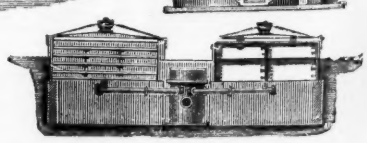

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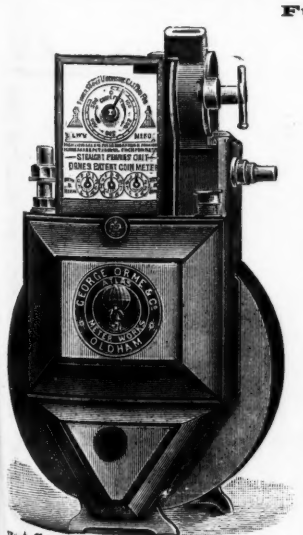
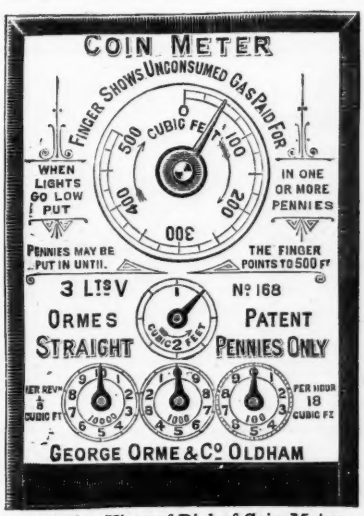
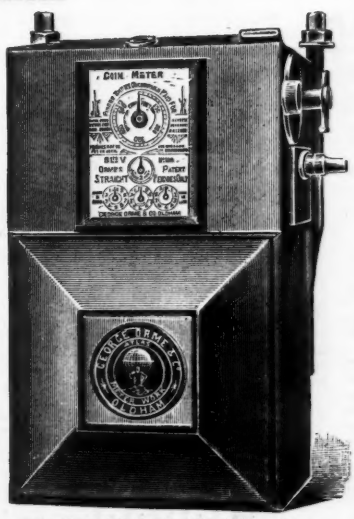


Wet Coin Meter in Tin-Plate Case.



Half-Size View of Dial of Coin Meter.



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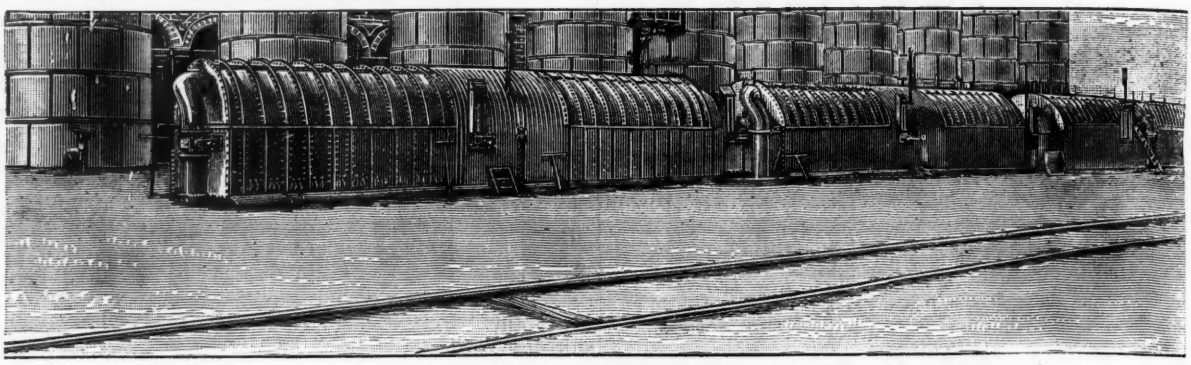

View of SIX PATENT "STANDARD" WASHER-SCRUBBERS, erected at the Beckton Station of The Gaslight and Coke Company (the Engines driving same being under Galvanized Iron Covers). This Company has **30** of these Machines in use. They are also in operation at a great number of Gas and other Works in this Country and abroad.

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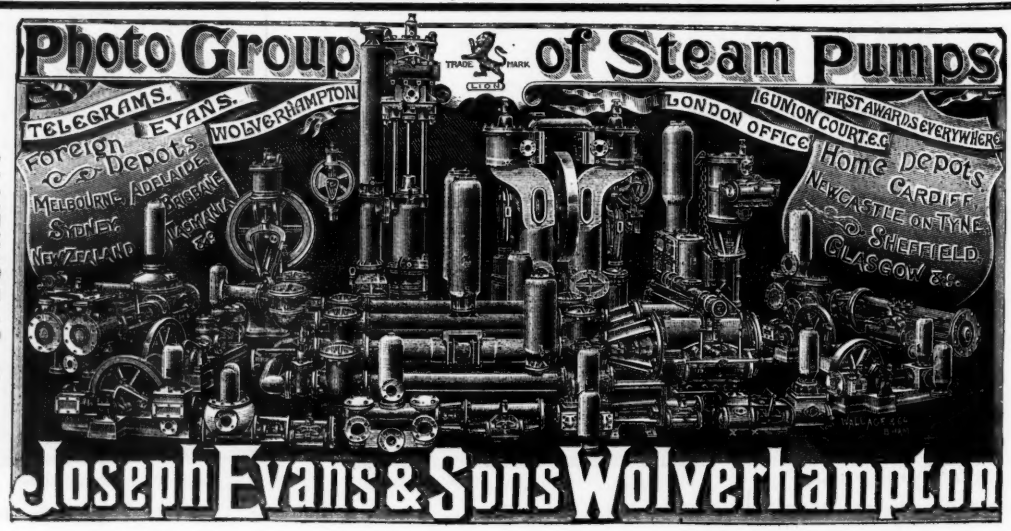
Photo Group of Steam Pumps
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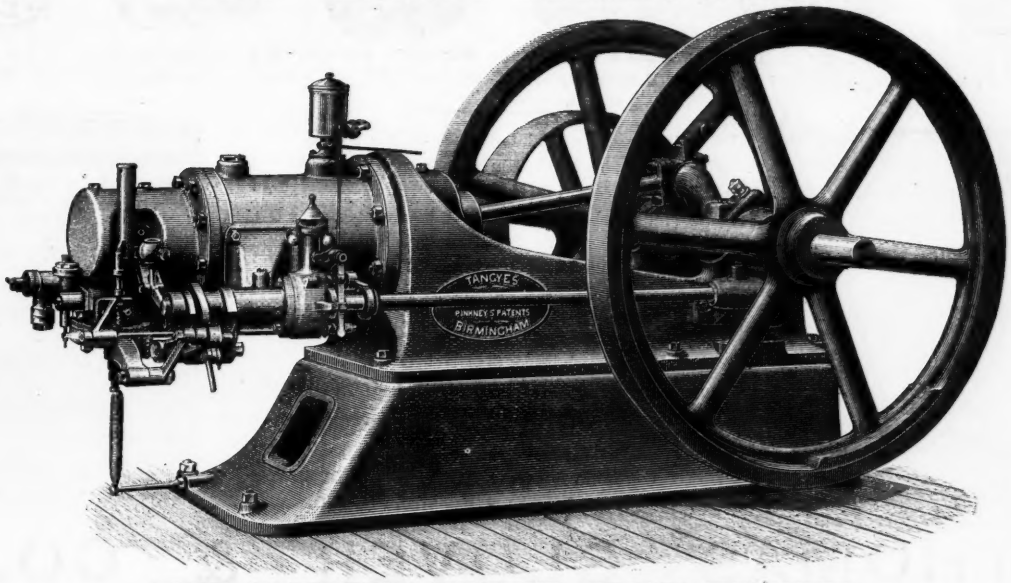

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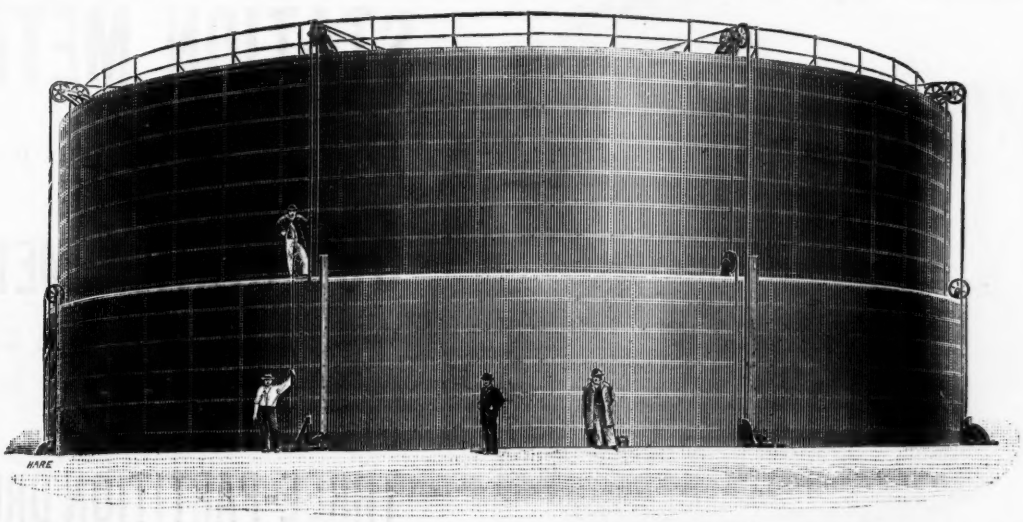

Illustration of BATHURST Holder, 82 feet diameter by 18 feet deep each Lift.

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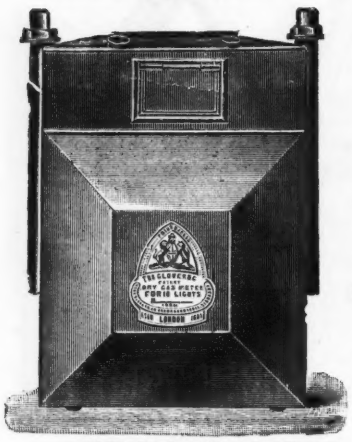

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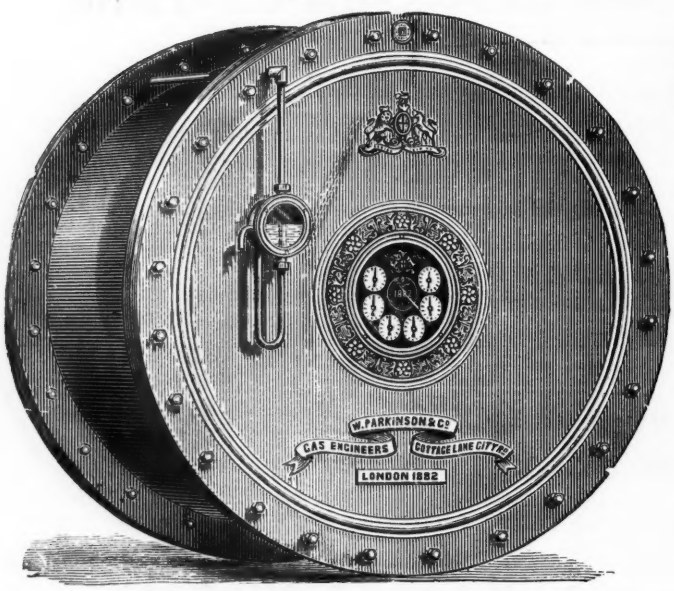

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, SEPTEMBER 18, 1894.

The South-Western Meeting—The Question of Prepayment Meters.

At the meeting of the South-West of England Association of Gas Managers at Frome last week—which, by the way, was a thoroughly successful "fixture" in all respects—the only technical matters discussed were the at-present vexed questions of the advantage of prepayment meters, and the guarantee given by makers of the "penny-in-the-slot" variety of these appliances for popularizing the use of gas among cottagers and artizans. The company being wholly composed of gas managers, it is hardly surprising, though it is a little disappointing, that practically only a single view of the question of the guarantee prevailed among the assembly. This narrowness of purview is no new feature of gas companies and their officials, as is shown by the great reluctance with which consumers' deposits and other devices for protecting gas undertakings from trade risks, have been relinquished in some quarters. The matter of the meter guarantee is merely a latter-day variation of the old problem of how much commercial risk a gas undertaking should take; and what was uttered on this subject by the majority of the speakers at Frome goes to strengthen the suspicion expressed at the close of our last week's commentary on the general subject. There is a good deal in what Mr. Durkin and one or two others said about the way in which this branch of the meter trade has been "rushed;" and this consideration ought to weigh more than it does with the purchasers of meters. The advantages attaching to the introduction of the penny-in-the-slot meters make more for the sellers of gas, than for the sellers of the apparatus for measuring it out by the pennyworth; and it is unfair to the latter that their hesitation to guarantee for five years a class of mechanical appliance that has, in many cases, been devised, carried out, and put upon the market in as many months, in response to a feverish demand, should be stigmatized as shabbiness, want of confidence in their own articles, or any other moral shortcoming.

So far, the argument for fairness is all on the side of the meter makers. As we showed last week, the excessive length of guarantee now, by a convention of long standing, given with dry meters, is purely exceptional; and it cannot be paralleled in any other department of trade. Moreover, for all that meter makers can foresee, the existing craze for penny-in-the-slot meters may be a passing fashion. Having persuaded a new stratum of customers into using gas by this means, some gas companies may grow tired of the system, and "go back" upon it. And in this eventuality, what would be the position of the meter makers? Up to the present time, it may be doubted whether the manufacturers have recouped themselves for their outlay upon patterns, templates, gauges, and all the thousand and one expenses that must be incurred before a single parcel of a new line in gas-meters can be sent out. Land has been bought, leases taken up, factories built and equipped, workmen trained, and all to meet the requirements of a new and admittedly experimental branch of manufacture. Do the country gas managers who comport themselves in so irreconcilable a fashion before the manufacturers' travellers, and think they are doing wonders if they order a few dozen meters of a new type in the course of a quarter, sufficiently realize these considerations? It is not for them that the manufacturers have laid their plans, but for the large Metropolitan and Provincial gas undertakings, with which—so far as can be understood—this difficulty about the guarantee has not arisen. We do not advance this observation with the intention of disparaging the small gas undertaking, which is, of course, worth the attention of the meter maker upon the principle that "mony a mickle mak's a muckle." But really the truth must be spoken by some unaffected third party; and it is that, unless all the meter makers' customers agree as to the guarantee or any other stipulation, the heaviest buyers must rule the conditions of the trade.

Of course, if any gas manager does not like the conditions applying to the acquisition of the penny-in-the-slot meters, he has the proverbial alternative. Some managers whose districts lie remote from the makers' works may reasonably hold the opinion that none of this class of meters is yet good enough to adopt definitely; but it would be absurd to hold off from the new movement, which has been proved to be capable of yielding good results, simply because perfection has not been attained in the manufacture of the apparatus. Not even all gas managers are perfect; but their employers are fain to make use of them, with results that are not unsatisfactory on the whole. Mr. James W. Helps spoke a word in season at Frome in reminding his brother gas managers that there is more than one description of prepayment meter open to be tried by those who would gladly extend the popularity of gas among the class of small householders, yet do not see the advantage of selling gas by the pennyworth. It is not for us to pronounce judgment upon the different patterns of prepayment meters in the market; but we should like to see a broader style of treatment of the general question prevail among gas managers than that which has recently sprung up.

The Gas Supply of Sheffield.

THE Chairman of the Sheffield United Gaslight Company, Sir Frederick Mappin, Bart., M.P., is one of those heads of gas undertakings who are by no means content to be "figure-heads." He takes a vivid interest in the working of the Sheffield gas undertaking; and he usually contrives to make his semi-annual addresses to the proprietors of the Company and the local public both interesting and helpful to both parties. Perhaps the most interesting feature of the Sheffield Gas Company is the circumstance of its being administered in close connection with the Corporation, by a unique application of the system of nominee directorships, the result of which is distinctly satisfactory. It is not that the admission upon the Sheffield Board of direct representatives of the Corporation has any marked or exceptional influence upon the conduct of the undertaking, which would in all probability be managed in exactly the same spirit without them; but the arrangement satisfies the Municipality as well as the general public. As a matter of fact, we do not believe that the introduction of this system into the administration of the London Gas Supply would be strongly resisted by the Companies, if it would only satisfy the public. The main point of the Sheffield Gas Supply is identical with that of London—the price and the profit are cut so close that there is no margin left to excite the cupidity of a Local Authority desirous of getting some source of income outside the control of the ratepayers. The price of gas in Sheffield is now down to 1s. 10d., 2s., and 2s. 2d. per 1000 cubic feet, which, if we were inclined to adopt the customary municipal locution, might be safely characterized as "cheap enough." Thanks to the fact that the supply is in the hands of a Company, however, the citizens of Sheffield know that there is no such phrase in the vocabulary of the local gas administration, which will take off another penny, or more, the moment there is an opportunity for so doing. It is small wonder that Sir F. Mappin's statement has been regarded as satisfactory by the Corporation and the townspeople. As we have so often argued, the price of gas is all the public care about; and when this is demonstrably low, there is no need for further explanation to commend the gas management. The only man in Sheffield whom Sir F. Mappin has failed to please appears to be the Manager of the local electric lighting concern, who is intensely annoyed because the Chairman of the Gas Company declares he is not afraid of him, and has also had the effrontery to accuse the School Board of extravagance in lighting some new schools by means of electricity from garret to basement. It certainly does seem extravagant to light a basement of an infant school maintained out of the rates by the most expensive system in use in a town; but the lavishness of School Boards seems to partake of the nature of incurable endemic disease. A noteworthy point in Sir F. Mappin's speech was his statement that, although the Company had fixed during the past twelve months 616 additional meters of all sizes, they had been required to take back 620 meters of the smallest (or 2-light) size, and two others of larger capacity. This was interpreted by the Chairman as meaning that the artizans of the town have felt the pressure of the times, and have had to give up their houses. Thus the gas undertaking, where it has a large artizan's consumption, has a finger, so to speak, upon the industrial pulse of the district; and it would not be surprising to learn that this Sheffield depression is traceable to disturbance of trade brought about by the coal strike.

The Form of Inaugural Addresses.

IN the appreciative notice that recently appeared in the JOURNAL of Dr. A. B. W. Kennedy's Inaugural Address to the Mechanical Science Section of the British Association meeting, we did not exaggerate the interest of this instructive dissertation, and hardly, indeed, exhausted it. There is one other reflection that our contemporary *Engineering* utters upon the form of the address as a whole which it seems worth while to repeat here, because it corroborates something that we have often urged in regard to compositions of the kind. Owing to the large number of gas managers' technical societies, there are probably more individuals actually or prospectively chargeable with the by no means easy task of writing a presidential address to be found among the regular readers of the JOURNAL than in any other technical coterie of equal size. We publish every year a large bulk of this description of technical literature; and it naturally follows that the quality of these multitudinous addresses is of considerable moment to a large circle of readers. Hence we long ago undertook the responsibility of doing what the members of technical societies are debarred by etiquette from doing on their own account—viz., criticizing actual presidential deliverances of sufficient importance, and offering to presidents *in posse* hints for guidance in the matter of the form of their addresses. The statistical or historical style of address had long outlived whatever utility it might have possessed in the days before technical journals were so plentiful as they are now, when we began protesting against it. In this protest, several scientific journals joined; for, as *Engineering* justly observes, this style of address is "a terror "to him that has to prepare it, and a burden to the listener." We do not know when our contemporary "advocated "in its place either an essay giving the results of the "speaker's experience in some branch of his profession, "or a mere formal acknowledgment of the honour done "him by his election;" but we have for a long time past recommended presidents to make the bulk of their address an exposition of their personal knowledge and opinions respecting technical matters. It is this that renders a presidential address interesting; for it is quite true that "if "there ever is a time in a man's life when it is fitting that "he should give expression to his opinions, it is when he "has reached the highest eminence that can be bestowed "by his compeers, and is in a position of advantage to "review his experience." Unless a man has previously been in the objectionable habit of imposing himself upon his colleagues to a nauseating degree (which is not often the case), the greater the individuality—a very different thing from egotism—which he can breathe into his address as president of a technical society, the fresher it will be. To be instructive, it is first necessary to be interesting; and even if a few blunders should creep into a presidential utterance, they will do less harm either to the speaker or the society over which he temporarily rules, than the old-fashioned cascade of leaden platitudes were capable of inflicting. Error may be corrected; dulness is irremediable.

How Did the Technical Term "Breeze" Originate?

THE study of words is an intellectual pastime that, as we have had opportunities of learning, is not distasteful to many habitual readers of these columns. It is, therefore, with some confidence of eliciting a reliable response that we venture to ask whether anybody who may chance to see this is in possession of exact information respecting the derivation of the word *breeze*, in its technical meaning of small coke or coke ashes. The inquiry suggested itself upon perusal of an article in an American periodical upon means for diminishing fire-risks, in which the writer observes that "there are many methods of combining "coal-ashes and plaster in a substance known in England "as 'breeze,' which is filled in between wooden or light "iron joists. I have asked," he goes on to say, "many "architects what 'breeze' was; and I think I have never "found but one who could answer the question." Curiously enough, it appears from his own words that the writer cannot correctly answer the question himself; for he seems to be under the impression that what is known as "breeze concrete" is called breeze, and that it is composed of coal ashes, instead of small coke, mixed with "plaster"—whatever this may be—instead of Portland cement. English gas engineers might think it almost superfluous to explain that the technical term "breeze," used in the vocabulary of their own industry, means nothing more than the small rubbish and sweepings of a coke yard, which have never passed through a fire, and are therefore not ashes. "Pan-breeze," again, means the mixture of ashes, small clinkers, and unburnt small coke, that collects in the water ash-pan under a retort-furnace burning coke. We believe the term is used but little, if at all, in North Britain—at any rate, in the cannel carbonizing region. There must have been a time and a place when and where this somewhat remarkable word first came into use. The place was probably London, because the material would accumulate in most notable quantities in the largest gas-works. But this is only surmise. Neither Accum nor Peckston mentions it, though both of these early writers upon coal gas manufacture use the word "coke" as a familiar term. For the derivation of this latter word—which, by the way, is popularly used in the plural form in the North of England—it is suggested

in "Chambers" that one should connote it with "cake," which comes fairly direct from the Latin root in *coquo*, to cook. When the manufacture of gas was introduced into France, many of the proper terms went with it, including the harsh-sounding "coke," which was perhaps rendered more easy of adoption by its Latin affinity. But now comes the most curious part of this philological exercise; for if we gave the word coke to the French, it appears at least possible that we have received the word "breeze" in exchange, supposing the term to have a root in the French *briser*, to break, which obviously suggests itself as the derivation, both for sound and sense. Yet why should it be necessary to suggest a French origin for this particular technical expression, whereas the French have taken from us all the other special vocabulary they needed in gas making? Another curious point in this investigation is that the French noun *brise*, which has practically the same sound as our common noun breeze means also the same thing—a cool wind. But this word stands alone; for all the compounds into which the monosyllable *brise* enters have some meaning which shows that they refer to the verb *briser*, to break.

The New Edition of "Michael and Will."

THE publication of another edition of "Michael and Will" is an event of sufficient importance to the statutory gas industry of the United Kingdom to call for mention here as one of the notable occurrences of the past week. We propose to make an early opportunity for explaining to readers of the JOURNAL the points of this fresh fruit of the labours of Mr. J. Shiress Will, Q.C.,—for the work is to all intents and purposes a new text-book of the law of gas, water, and electric lighting. Without anticipating the part to be played in this regard by the reviewer, however, we may offer a few words of thanks here to the eminent author of this *magnum opus*. A book of the kind, to be worth anything at all, should be a law library in itself; and this is just what "Michael and Will" ranks as being in the estimation of those responsible for the administration of gas undertakings in all parts of the United Kingdom. The addition made to this edition in respect of electric lighting law is well thought of, and renders the volume a complete compendium of the legal side of the three cognate public services. Of the making of law-books there is no end; but it is hardly conceivable that the pre-eminence of "Michael and Will" in the field which it covers will be contested; and we cherish a particular hope that a copy of the new edition will forthwith find its way into every gas office in the kingdom, for direct consultation in some of those instances of doubt and difficulty which, to judge from our correspondence, not infrequently arise to trouble the headquarters staff of the smaller as well as the largest order of gas undertakings.

The Autumn Meeting of the Incorporated Institution of Gas Engineers.

THE particulars of the programme arranged by Mr. Alfred Colson, the President of the Incorporated Institution of Gas Engineers, for the autumn meeting of the Institution, which is to be held at Leicester on Tuesday and Wednesday of next week, will be found in another column. It is unnecessary to repeat here the details of these arrangements, which testify to the solicitude of the President to render the proposed visit to Leicester attractive to the members of the Institution. But we gladly give this additional notice of the meeting, for the sake of the opportunity of impressing upon the recipients of Mr. Colson's invitation the desirability of their responding to it in sufficient numbers to make the gathering a success in all respects. The generosity and public spirit of the President deserve, to say the least, the requital of an adequate response. Moreover, the idea of holding an autumnal national gathering of gas engineers, with the main objects of combining instruction with amusement through the eye, by visits to works, &c., without the reading of technical papers, and of facilitating social intercourse, is as yet in the experimental stage; and it remains to be seen whether it will prove successful in a normal year. Whatever may be the character of next week's meeting in point of numbers, however, the part taken by the President in regard to it cannot but redound both to his personal credit for hospitality, and to the reputation for courtesy of the many prominent townsmen who have so kindly seconded his efforts to attract the members of the Institution to Leicester.

WATER AND SANITARY AFFAIRS.

A LETTER from a physician residing in the Hackney Road has appeared in the daily press, complaining that the water supply of a large part of East London has been cut off "regularly every night" for some weeks past. We have no doubt the East London Company regret, as much as anybody, that there should be any necessity for reducing the supply at night, though only for a time, and in part of their district. But it is surely a very faulty kind of logic which cites this incident as contrary to the report of the Royal Commission, which certified that the London Water Supply was sufficient for many years to come. The water is abundant, but the works are in some cases becoming deficient; and for this fact Parliament is in a certain measure to blame. Last year the East London Company had a Bill in Parliament, by which power was sought to raise capital for the purpose of increasing the capacity of their reservoirs, and laying additional mains. But the idea was scouted by members of the House of Commons connected with the County Council; and the Bill was rejected on the second reading, without being allowed to go before a Select Committee. The opponents of the Bill urged that the Company had themselves alleged that there was enough water for forty years to come. But the question was one of works; and these were subject to a year's delay by the action of Parliament—the balance being turned against the Company by the Irish vote, in response to the active exertions of Mr. John Burns. This year Mr. Shaw Lefevre pleaded for further delay; and the East London Bill narrowly escaped another rejection. The mischievous character of this opposition is now apparent. The East London Company, after taking the lead in the voluntary introduction of the constant supply, are obliged to act with caution, shutting off part of the supply at night, when it is little wanted, in order that there may be an abundant supply in the morning, when the demand is for a time excessive. When the new works which the Company have devised are constructed, the constant supply will go on night and day all the year round, throughout the Metropolitan portion of their district, if not also over the border.

The subject to which we are now referring has recently been discussed by the local press; and we meet with this remark: "It is an open question whether the needs of "East London, grown beyond all proportion to the original "demands when the Company was first constituted, can "be adequately met by the natural sources of supply at "present at the command of the Company." We may here remark that this question is no longer "open," but has been settled by the report of the Royal Commission, which states that "with adequate additions to the present system "of storeage," there is no reason to apprehend any deficiency in the supply to the East London district. In writing on this question, *London* ventures to assert that, even when additional storeage is secured, "it will be found "that the Lea is an inadequate source of supply alto-"gether." Yet the Royal Commissioners included the resources of the New River and East London Companies in their calculation as to the resources of the Lea and Thames Valleys; and they showed that the total, in connection with suitable works, would yield a supply more than sufficient to meet the wants of the population in and about London down to the year 1931. In defiance of all this, we are told by the hebdomadal organ of Spring Gardens, "that the whole case is one "which emphasizes the utility of the County Council's "action in seeking for new sources of supply for the whole "of London." From our point of view "the whole case" demonstrates the recklessness of the County Council in seeking to prevent the extension of the existing works in accordance with the growing requirements of "Water "London." If "new sources of supply" are to be introduced, new works will have to be constructed; and many years must elapse before these can be rendered complete. In the meantime, could the policy of the County Council prevail, a large part of London and its environs would be left in peril of a serious deficiency in the supply. If the present need is as pressing as the opponents of the Companies would make it appear, there is the more reason why the existing works should be extended.

On a recent occasion we referred to the omission of the Kent Company from the bacterioscopic report of Dr. Frankland on the Metropolitan Water Supply. We have

now to mention—not the absence of the Company on the list, but the entire absence of the microbes. We never remember to have seen such a result in the Metropolitan waters, though there has been a close approximation to it sometimes, not only in the case of the Kent supply, but in some other instances. Now there is an actual cipher as to the presence of microbes in the water from one of the deep wells of the Kent Company. Actual sterilization is thus brought about by the passage of the water through a great depth of chalk. Sand filtration is accomplishing much in the treatment of the river waters. Thus water taken from the Lea at Angel Road by the East London Company is made to rank with the deep-well waters in respect to organic purity; while its bacterial improvement in certain cases amounts to 99·33 per cent. It is reported of the New River Company, that water taken from the Cut was improved by filtration so as to eliminate 99·45 per cent. of the microbes; while in respect to organic purity, this supply also equalled the deep-well waters. It is not filtration alone which operates on the raw river waters. Storeage has a great effect. The Chelsea Company are able to store water for a fortnight, with the result that only 440 microbes survive the imprisonment, out of more than 2000. In the actual supply, after filtration, the microbes were further reduced to 18.

United Cannel Collieries, Limited.—In another column will be found the prospectus of this Company which has been formed to purchase the "Coed Talon" and the "Black Diamond" cannel and coal leasehold mineral estates, together with the plant, machinery, railway sidings, mining rights, freehold land, houses, and other properties connected therewith, and to provide sufficient capital to develop and work the same. The two estates, which have hitherto been worked under separate management, adjoin; and they are situated in the well-known Leeswood cannel district at Coed Talon. They comprise about 1100 acres of mining property, together with 13 acres of freehold surface estate. The business has hitherto been confined to working coal; but the particular object of the present Company is "to work the united properties so as to win, as cheaply as possible, the large quantity of valuable cannel which has been proved under both estates, and which, with the coal, is estimated to realize within 12 years a profit in working of over a quarter of a million sterling." Among others who have examined the property is Professor Vivian B. Lewes, F.I.C., F.C.S., of the Royal Naval College, Greenwich, and Gas Examiner for the Corporation of the City of London. He writes: "With regard to the future of cannel coal, I am of opinion that, although oil gas, carburetted water gas, and enrichment by the vapours of light naphthas, are being used at some works to increase the illuminating value of coal gas, cannel will certainly hold its own for many years to come. The experiment of enrichment by the above means would never have been tried by the gas managers of this country had not the high price and increasing scarcity of cannel during the past few years driven them to seek substitutes for it; but if good cannel were easily obtainable, gas managers would be only too glad to continue its use in preference to other means of enrichment." The list of applications for shares in the Company close almost immediately.

Gas Traction for Tramcars.—The advertisement on p. 574 of the JOURNAL to-day would appear out of place in our columns if judged only for its heading; but there is a paragraph in the prospectus of the Blackpool, St. Anne's, and Lytham Tramways Company, that will appeal specially to our readers—that which deals with the system of traction proposed to be employed. This is the invention of the late Herr Lührig, of Dresden, as improved by Mr. H. P. Holt, of the firm of Messrs. Crossley Bros., Limited of Manchester, makers of the "Otto" gas-engine. The car is self-contained; the motor, which is a two-cylinder "Otto" engine specially constructed, being fed with gas from three reservoirs underneath the car. The gas is to be stored under the low pressure of eight atmospheres, or 120 lbs. to the square inch; and one charge is said to be enough to run the car from eight to ten miles. It is claimed that the manipulation of the car is very simple—consisting of a lever which, according to its position, drives the car either forward or backward, or stops it altogether. There is also a brake lever. The performance of the car is reported to be quite satisfactory; it attains easily a speed of eight miles an hour (the limit allowed by the Board of Trade), and can be stopped by the brakes within its own length. Other interesting details of the Company's proposals are contained in the prospectus, the object of which is to obtain subscriptions for £100,000 of capital to carry out a project sanctioned by a Special Act of Parliament passed in the session of 1893. Besides Mr. Holt's, there is on the Board of the new Company another name well-known among gas people—that of Mr. Malcolm Guthrie, J.P., one of the Directors of the Liverpool United Gas Company; so that there is no doubt gas will be fairly dealt with, on its merits as a traction agent, by the Company when they get fairly to work. The list of applications for shares in the Company, it should be noted, closes on Thursday.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 571.)

THE past week opened quietly enough on the Stock Exchange; but it rapidly developed a degree of activity, which forcibly contrasted with the previous inertness. The chief feature was the advance in favour of some of the speculative issues, and especially those of South America, such as the public for some time past have only contemplated with horror. This was owing partly to the progress which the Governor of the Bank of England was able to point out in his speech at the Bank meeting, and partly to the ever-increasing volume of money wanting investment, some of which is trickling into the less-favoured channels. It is to be hoped that the public will not overrun the march of improvement, but cautiously keep pace with the actual lines of progress. First-class securities are still bought largely; but Consols have now apparently reached their top price. The Gas Market has been fairly active; and issues of all sorts have gone up wonderfully in value. The best issues appear to be scarce; and the considerable increase in prices recently established does not seem to tempt sellers to any appreciable extent. Of the Metropolitan Companies, Gaslight "A" opened weaker, and went down to 239. But it ultimately recovered in the general advance; and the closing mark was 244. The secured issues were very active in response to a brisk demand. All realized high prices; while the 10 per cents. advanced their quotations. There was rather more doing in South Metropolitans last week than of late; but stock was scarce. All three issues have risen in price. Nothing was marked in Commercials old or new; there being no sellers. The quotations of each issue have been put up a couple of points. A small quantity of debenture stock changed hands at good figures. There was hardly any business in Suburbans and Provincials, though higher prices are bid for many of them—*e.g.*, Brentford, British, and Crystal Palace. Business was active in Imperial Continental, which rose a point; but the other Continental undertakings were very quiet. Buenos Ayres has made a further considerable advance, owing to the South American movements already referred to; and Melbourne debentures are higher. Water Companies were very quiet, but very strong; Lambeth showing an advance.

The daily operations were: Business in the Gas Market was somewhat restricted on the opening day; but prices were very good, except for Gaslight "A," which fell 1. British rose ½. Tuesday's business was only moderate; but prices were better all round, though quotations did not move. Wednesday would have been abnormally quiet, but for brisk business in Imperial Continental. Melbourne bonds rose 2; but San Paulo fell ½. On Thursday, Imperial continued active and improving, and several transactions were marked in South Metropolitans; but the rest were almost stagnant. Buenos Ayres gained ½; and ditto debentures, 1½. Lambeth Water moved up 2. Business was quiet on Friday; but many quotations advanced. Imperial Continental, Gaslight "A," and ditto "J" improved 1 each; ditto "C," "D," and "E," South Metropolitan "A," and ditto "B," 2 each; and ditto "C," 3. Saturday was active and important; the general advance gaining ground, with an improvement of 2 each in Brentford new, both Commercials, and Crystal Palace.

ELECTRIC LIGHTING MEMORANDA.

A Lighting War in Adelaide—Honesty in Automatic Trading—The Fortunes of the Electric Construction Company—An Electric Candle Wanted.

IT has been rather amusing to observe the fierce controversy that has been, and still is, in progress in the city of Adelaide, South Australia, over the question as to whether the Corporation should undertake the supply of electric light from a central station. The South Australian Gas Company have taken a prominent part in this discussion, into which course they can hardly have been led by utterly selfish motives, as their opponents try to make out, because no electric lighting plant ever yet hurt a gas company—especially when managed by a local authority. As a matter of fact, many of the English and Scotch municipalities owning their own gas-works have gone in for electric lighting, invariably confiding the management of the new business to the Gas Committee—mainly with a view to the convenience of proximity to the till of the gas department. In Adelaide, however, a number of citizens connected with the Gas Company believe, rightly or wrongly, that the Corporation is being "got at" in regard to the electric lighting scheme, by persons whose interest it is that public money should be spent upon the venture. And it must be admitted that a good deal of pressure is being exercised in this direction upon the City Council, the members of which body hardly know how much to believe of the cases presented to them on both sides. Among other weapons employed in this wordy war, is a pamphlet prepared at the instance of the Gas Company chiefly from materials appearing originally in these columns, and designed to show up the "seamy side" of the electric lighting industry. Another pamphlet has been prepared in reply by the City Surveyor, a copy of which

has been sent to us. We notice in this official compilation, a remark that the JOURNAL, "from the date of the first successful inauguration of electric lighting up to the present time, has manifested a most virulent jealousy of the newer illuminant; never once has it ceased to ignore the successes of electricity, or to magnify the drawbacks and the accidents with which the introduction of the new light has been attended." As a matter of fact, not a single statement that ever appeared in this column with respect to electric lighting has been proved to have been false; few have been challenged even in the electrical press, with which we live on excellent terms; and if we have a mind to exhibit the "seamy side" of the electric lighting industry, why should we not do so? There are plenty of press apologists for electricity in every shape. It is new and fashionable; but we shall go on telling the truth about it, from our point of view, without fear of the dreadful charge of being "biassed" in favour of gas. Nobody can ever accuse us of pretending to impartiality, which would be a ridiculous pretence indeed.

Let us hasten to give praise where praise is due, as it unquestionably is to the highly moral "penny-in-the-slot" electric reading lamp lately introduced into the Metropolitan Railway carriages by Messrs. Laing, Wharton, and Down. These most ingenious arrangements are admirable on many accounts; but their chief claim to distinction rests upon the astonishing fact that, when there is no energy left in the accumulator, and consequently no light to be had, the money is actually returned to the would-be user! Such honesty on the part of an automatic prepayment machine is so exceptional, that it is not to be wondered at that the public are generally unaware of this peculiarity of the railway-carriage lamp, and consequently leave many pennies upon the rack where the right-minded apparatus deposits them when it has no value to give in return. It is sad to think how much superfluous profanity every such coin represents; for, unhappily, the telephone and the automatic delivery machine, convenient as these gifts of civilization are in the main, have not tended to ameliorate the manners and morals of those who habitually use them. This charge does not apply to the automatic prepayment gas-meter, inasmuch as it is a domesticated apparatus; but when a public telephone or penny-in-the-slot machine fails to act in the manner expected of it, the disappointed patron has no redress.

The first annual general meeting of the Electric Construction Company was held on Thursday last, under the presidency of Sir Daniel Cooper, the Chairman of the Company. This concern is the result of one of those reconstruction arrangements with which the history of electric lighting enterprise in this country has made the public so unpleasantly familiar. It started as a development of Elwell, Parker, and Co., the well-known Wolverhamption electrical and mechanical engineering firm; and the old Company was reconstructed last year. Soon after this operation appeared to have been satisfactorily effected, according to the Chairman's statement, a split occurred between the Board and Mr. Parker, with whose further services the Directors considered it desirable to dispense. Such troubles are not good for business; and it appears that the Chairman himself is not satisfied with the working of the Company for the past year, which shows too small profits and too large expenses. Notwithstanding this, there is to be a fresh issue of capital. Of course, the Directors hope for a more prosperous future; but seeing that they have been compelled to admit that during the past year a deliberate attempt was made to "put the Company in a corner," which was only defeated by the adoption of heroic measures of internal administration, it can be easily understood how the ordinary shareholders feel about their position and prospects, with a rival concern starting in their own neighbourhood.

The French Society for the Encouragement of National Industry, offer a prize of 2000 francs for an electrical incandescent lamp having an intensity of 1 candle, and working at one-twentieth of an ampère under a difference of potential of 100 volts. It has been remarked that ordinary incandescent electric lamps, while answering very well for places where a brilliant light is required, are too powerful for small rooms or anywhere where a soft light, not trying to the eyes, is to be preferred. Electric lamps of very low intensity, producing in rooms very much the effect of stearine candles, would be better suited to decorative purposes than more powerful lights. It is calculated that, at the maximum price charged for current by the Parisian stations (1·5 francs the kilowatt hour), a lamp of one "decimal" candle power, of the character required by the conditions of the prize, would only cost 0·75 centime per hour, which is about one-fifth of the cost of an "Etoile" stearine candle. The offer is to stand good until the end of 1896; but have we not sham electric "candles" already?

Professor Percy Frankland has now taken up his new duties at the Chemical Department of Mason College, Birmingham, removing from University College, Dundee, last Saturday.

Death of Mr. E. Walmisley.—The death is announced, in his 76th year, of Mr. Edward Walmisley, of Abingdon Street, whose assistance many of our readers have sought in connection with their applications to Parliament. Deceased was Chairman of the Goring and Streatley District Gas and Water Company, and was on the Boards of the Brentford and Hornsey Gas Companies and of the Mid-Sussex Water Company.

A LESSON IN INDUSTRIAL ECONOMY.

IT is scarcely necessary to argue, at this time of day, for the existence of a Science of Political Economy. People of fair education are in the habit of thinking that the foundations of the science so called were laid by Adam Smith, and that the structure has been solidly built, in a plain but useful style of architecture, by Ricardo, Bentham, Mill, and a host of other thinkers, down to Professor Marshall. Yet it is one of the most striking characteristics of the day, or rather, of the public men of the day in which we live, that they repeatedly say and do things calculated to raise doubts as to the truth and utility of what have been taught as the fundamental data of this particular science. This is nothing if not true and useful. In other words, instances daily occur in which, to quote the immortal Captain Cuttle, the bearings of the observations of the political economists should lie in the applications thereof—and these applications are never made. Indeed, most of what is interesting and living in the industrial developments of the times, appears to spring up and struggle on without the slightest reference to the precepts of the science which is supposed to treat of the springs of action of mankind, as traders and producers. We see this illustrated by our Trade Union Congresses, Independent Labour parties, and other manifestations of the working of the Time Spirit among the poorer classes in the community. If there is a Science of Political Economy, there ought not to be a John Burns, or a Tom Mann, or a Keir Hardie. Yet these representatives of revolt against the established system of industrial society are in high feather, and take delight and find profit in saying things in the ears of the people of a nature to drive an orthodox political economist "howling to his gods."

Representatives and associates of the employer class in the community are prone to regard this shameless heterodoxy as something very shocking. Those of us who have been to college, and read many ponderous books professing to tell all about the way in which the working world does its business, are apt to call the Manns and Tilletts blind men attempting to lead the blind through the mazes of the densest problems ever presented to painfully striving humanity. These poor fellows have not had our advantages, of course; but ought they not to be silent, or at least take a few lessons from an University Extension lecturer, before setting up as teachers of the multitude that hangs about park gates and frequents empty railway arches on Sunday afternoons, while the public houses are shut? The mischief is that common workmen will not join classes for the study of Political Economy, even if the cultured Professors of this science of the study and the arm-chair would care to have them for pupils. They will not of deliberate intent study anything, or read anything, but newspaper reports of murders, bigamies, and sporting events. There are moments, however, when these men have nothing to do, nothing to think about, and nothing to say; and these idle times are the agitator's opportunity, of which he is not usually slow to avail himself. Not many years ago, the peripatetic Socialists who went in for this class of business used to hold forth wherever they found a handful of loafers, and send round the hat when they had done speaking. This crude proceeding had the invariable effect of dispersing the assembly; and the poor orator was left comfortless. At last, a happy idea occurred to some of the astutest of the talking fraternity—they called themselves Trade Union leaders, and sold cards of membership instead of begging for coppers. The plan worked like a charm; and the out-at-elbow Socialist of the last decade is now, if he knows how to keep decently straight, a Member of Parliament, an Alderman, and a personage to whom prominent politicians usually deem it advisable to be civil—but he has learned no Political Economy the while.

In observing this weakness of the professional labour leaders, employers, and those who speak for them in the press and elsewhere, are liable to lose sight of the fact that, when it comes to the pinch, this class, upon whom the light of Political Economy has shone for generations, are not a whit more disposed to rely upon the assurances of this science than is the working man. Wages and working hours are the particular applications for the rules of economic science in the case of the working man; and when he has made his mind up so strongly in favour of trying for an improvement of his condition in either respect as to be ready to strike for it, it is quite idle to talk to him about the law of supply and demand or any other theoretical consideration supposed to affect the issue. The employer is often just as bad—worse, indeed, inasmuch as he ought to know better. Ask him how it is that trade is bad, or how it is that his particular trade is getting away from him and into other hands; and the chances are greatly in favour of his uttering in reply as many and as grievous economic fallacies as can be found in an average socialistic oration.

A striking illustration of this weakness on the part of employers, is afforded in connection with the recent visit of the Iron and Steel Institute to Belgium. It was very natural that members of the Institute should like to go to Belgium, for Belgian competition in the iron and steel and hardware trades generally is a very sore point with English traders. Well, these gentlemen went, and appear to have seen all that there was to be seen of the ways and products of the Belgian manufacturers; and the show was more than many of them expected to see, or

could properly understand. A number of these members of an order of business men which we would like to hold in estimation as second to none for perspicacity and sound commercial sense, communicated to various technical journals on their return their impressions of the condition and prospects of the Belgian iron and steel industry; and their cry was that the Belgians are beating us because they work long hours and for little pay. This was the burden of the song sung in the ears of the Editor of the *Engineer* by an "influential member" of the Institute; and it is echoed by many others in the columns of the *Ironmonger*, and other publications. All we can say about it is that those who raise such a cry ought to be ashamed of themselves; for it is a cry of ignorance, of cruelty, and at the same time a confession of defeat. It is true that the arm-chair economist Ricardo thought, half a century ago and more, that long working hours and low wages were essential to cheap production; and this cruel fallacy hindered the passing of the Factory Acts for many years after they were urgently needed. Men of fuller knowledge and deeper wisdom than Ricardo, however, long ago recognized the truth that the better the condition of the workman, the better and greater his output will be; and this discovery has been endorsed by Professor Marshall, as containing more promise for the future of the industrial world than anything else that can be named. Yet, in face of this perfectly familar teaching of the most advanced economists, "influential" iron-masters are found ready to father as an acceptable explanation for the goodness and cheapness of much Belgian hardware the exploded excuse that the Belgian employers pay their work-people little and work them hard and long. As our contemporary the *Engineer* well remarks upon this head, "the proposition is one of such transcendent importance, that it deserves very careful examination." We are glad to see that our contemporary, after careful investigation of available data, treats the proposition as not proven.

The employer who, like Truthful James in Bret Harte's poem, cries out that he is being ruined by foreign "cheap labour," is no more respectable a character than the professional strike organizer who tells workmen that higher wages are all they need to make them happy. With regard to the competition of Belgian with English manufacturers in the iron and hardware line, it occurs to few of the latter that there is no reason in the nature of things why Belgium, or any other country possessing the natural facilities, should always lag behind us. We had a long start, but we cannot keep other nations back; and since the needs of trade alter with the course of time, it is always an open question as to which producing country is best adapted to satisfy the demands of successive generations of consumers at home and abroad. The same observation applies to the mutations of centres of industry in one country. The iron trade, for example, has shifted its headquarters several times in England, for reasons with which the claims of labour have nothing to do; and if the lead in the iron trade of the world should leave England altogether, it will not be because of any particular rate of pay received by workers here compared with labourers of the same order elsewhere.

Behind the question of wages rates lies, for the employer, that of the cost of labour, and for the workman, that of the commodities he can obtain in exchange for his week's pay. As we see, both employers and employed are apt to look too exclusively at the mere wages rate, which is against all economic teaching, and is distinctly reactionary. If the Trade Union leader and the employer join in the cry "Look at the rate of wages!" wherein is the one a safer guide than the other towards a solution of the industrial problem? Many employers of labour in this and other countries have come to think that there will be no satisfying the workman while wages, and wages only, recompense his toil. Hence the movement in the direction of profit-sharing, which is not by any means a panacea, but is rather a concession to the humane sentiment which seeks in the modern industrial world some such means of engaging the workman's interest in his employment as the journeyman of old possessed in the hope of becoming a master in his turn.

Our contemporary, in examining Belgian industrial conditions and methods, rather goes out of its way to dismiss profit-sharing as a "hopeless failure"—whether in England or Belgium is not made quite clear. We are told that in Belgium all employees are given an interest, not in the profits, but in their position, "They get more than money." When one proceeds to inquire what this additional something is, it is found to consist of cheap lodging—provided by the employer; free schools—also provided by the employer; and cheap flour and other necessaries, supplied at about cost price from the employer's stores. These advantages are supposed to satisfy "*Les braves Belges*," and keep them from striking like their English fellows. If this is so, the Belgian workman must be a very easily-satisfied man; for part payment by "truck," whether to the employer's profit or not, never yet made an English or an American workman contented. We agree with the *Engineer*, in thinking that English manufacturers have no reason to fear Belgian competition on the score of wages; but we are sorry our contemporary's survey of the condition of the Belgian workman leads to no more than the "lame and impotent conclusion" that he is happy in being paid partly in kind.

It is too late in the day to talk of reducing the British workman to the status of a pensioner upon the manufacturing concern with which he is connected, by providing him with free schools, and coddling him after what is reported to be the manner of the philanthropic Belgian employer. The philanthropy of joint-stock commercial organizations is "suspect," and naturally so. "A Staffordshire steel manager who declines to allow his name to appear," informs the *Ironmonger* that the Belgian makers have "doubtless an eye to their own ultimate gain in establishing these schools, classes, clubs, &c." This gentleman remarks that the physique and general bearing of Belgian operatives are improving, with their advance in discipline and the avoidance of excess. Soon they will want more money and shortened hours, like Englishmen; and then things will be more equal all round. There is sound sense in this. Moreover, what the workman wants is more independence of his employer, so as to learn how to save for himself rather than trusting to the employer to economize for him. Again, as the day of the small master is passing away, so let us hope that the day of the small investor is dawning. If fewer workmen can hope to become employers, there is all the more reason for their becoming shareholders in the corporations which are supplanting the individual employer. Although the industrious apprentice does not now-a-days as a rule marry his master's daughter, he may aspire to the less romantic, but perhaps on the whole more satisfactory, reward of holding stock in the company he serves; while it is certain that the reward of the idle and dissolute apprentice will be the same as it ever was. It is not for nothing that the figure of St. George and the Dragon remains on the reverse of our newest English sovereigns, to be a reminder that the possession of these coins can only be won by those who conquer the powers of idleness, shiftlessness, and debauchery—which, as was said at Norwich by the President of the Trade Union Conference, are still the greatest foes of the working man.

The Vacancy on the Board of the Brighton and Hove Gas Company was filled at last Friday's half-yearly meeting of the shareholders by the unanimous election of Mr. R. Hesketh Jones, J.P.; 317 proxies having been lodged in his favour.

The Management of the Haywards Heath Gas-Works.—After 25 years' service, Mr. John Oram, the Manager of the Haywards Heath Gas-Works, has been superannuated; and Mr. Channon, of Swindon, has been appointed to succeed him.

Admiral Sir Edward A. Inglefield, K.C.B., the Chairman of the Incandescent Gas-Light Company, died on Wednesday, the 5th inst. The gallant Admiral had had a very distinguished career, and had been the recipient of many decorations. As Chairman of the above-named Company, he gave his hearty support to all efforts to place the concern in a sounder position than it was in when the present Board took office; and the good work that he, his colleagues, and the officials have collectively accomplished of late has been noticed from time to time in our pages.

Incandescent Gas Lighting for Drury Lane Theatre.—Drury Lane Theatre, which re-opened on Saturday, is now lighted throughout with the Incandescent Gas-Light Company's system. Sir Augustus Harris, having tried this system for certain parts of Covent Garden Theatre during the Opera season, found it so satisfactory that he determined to introduce it at Drury Lane in preference to the electric light, which was installed in parts of the house—the rest being lighted with ordinary gas-burners. This is the first large London theatre which has been lighted by the incandescent gas system; and the effect will be watched with interest.

Presentation to Mr. T. N. Ritson.—To mark their appreciation of Mr. T. N. Ritson's management of the Kendal Gas and Water Company's business since he took their affairs in hand two years ago, the Directors of the now dissolved Company have presented him with a handsome silver salver, suitably inscribed and tastefully ornamented by hand engraving. The presentation was made last Wednesday week, by the ex-Chairman (Mr. W. D. Crewdson), who, in the course of a short speech, said nearly the last act of the Board was to present a testimonial to their Manager, as a mark of their high appreciation of the ability shown by him in having so ably assisted them in bringing the affairs of the Company out of the troubles which had given them so much anxiety in the summer of 1892. They had found in Mr. Ritson, from the time he first came to the works, a Manager who had given constant thought and care to the interests of the Company, and who had again, in a surprisingly short time, worked their affairs into a state of soundness and prosperity. The Directors felt they could not allow their close and friendly relations with Mr. Ritson to close without giving him a substantial token of their esteem and goodwill. Mr. Ritson, in thanking the Directors, said he had never dreamt of receiving so valuable a gift from them. He had determined, on the day he first set foot in Kendal, to do his best to retrieve the position of the Company, and the best proof of his work existed in the balance-sheet for the past year, showing that the whole of the suspense amount had been wiped off, besides leaving a very good sum in hand. The salver bore the inscription: "Presented to Mr. T. N. Ritson, by the Chairman and Directors of the Kendal Union Gas and Water Company, on the occasion of the transfer of the business of the Company to the Corporation of Kendal, in remembrance of loyal and efficient services. Aug. 21, 1894."

NOTES.

Popular Carbonic Acid Determination.

A method of making a simple apparatus for estimating the proportion of carbon dioxide in air, suitable for popular use, and quite delicate enough for making ventilation tests, &c., was described by Dr. Cohen and Mr. Appleyard at the British Association meeting. The method depends upon that fact that if dilute lime water, coloured with phenol-phthalein, containing insufficient lime to combine with the carbon dioxide present, is shaken with the sample of air, the rate of absorption of the gas will vary with its volume. The time required to decolourize the indicator will therefore give the quantity of carbon dioxide present. The apparatus and chemicals required comprise a clear glass stoppered bottle of 22 oz. capacity; a solution of phenol-phthalein, prepared by dissolving 0·2 grm. in 100 cubic centimetres of equal volumes of alcohol and water; a standard lime solution, prepared by diluting 10 cubic centimetres of saturated lime water to the litre; and hand-bellows for aspirating the sample of air. The test is made by rinsing out the bottle with water, draining it for a minute, and aspirating the sample of air by means of the bellows. One-third of a cubic centimetre of indicator solution and 10 cubic centimetres of the dilute lime water are then added, and the bottle stoppered and well shaken until the pink colour vanishes. The condition of the air will be indicated by the time required to produce this result. If this is under three minutes, the condition of the air may be called bad; if above three and under five minutes, the air is fair; if over five minutes, it is good.

The Treatment of "Gassed" Patients by Oxygen.

It has been recently argued by Dr. Haldane that, in some cases of suffocation, or "gassing," the mischief is due to a deficiency of oxygen in the atmosphere, which acts very differently upon the human organism from a mere superfluity of carbonic acid gas. Suffocation through the latter case is preceded by gradually increasing respiratory distress, in which the neuro-muscular system is raised to greater activity. In suffocation by deficiency of oxygen, which occurs when the atmosphere contains less than 8 per cent. of oxygen, the attack begins with an extremely sudden attack of muscular paralysis; so that there is little warning of the danger when such air is respired, and little chance of escape owing to the muscular failure. Dr. Haldane thinks that the most effectual remedy in such cases is the inhalation of pure oxygen from portable storeage cylinders of the gas. This opinion is supported by a statement in the *Chemical Trade Journal*, respecting the treatment of men "gassed" by producer gas. After giving particulars of the condition of two men who had suffered in this way, and been treated by the usual methods, it is recounted how another man similarly affected was successfully treated by oxygen. The man had apparently ceased to breathe, his eyes were closed, and he had every appearance of being dead. A bottle of oxygen was connected up with an india-rubber tube, the end of which was put into the man's mouth. The mouth was then tightly held, the oxygen quickly turned on, and after an instant turned off again. The effect was magical—the man's eyes at once became bright, and he commenced to breathe. After another dose of oxygen, the man recovered consciousness, was freed from pain, and in a quarter of an hour was able to walk with assistance. Though his case was the worst of the three, this man was back at work the following morning. The inference is that managers of works where men are liable to be "gassed" should keep a bottle of oxygen at hand, and give the remedy a trial.

A Pneumatic Pyrometer.

In an article as to a pneumatic pyrometer recently published in *Engineering*, Dr. Henry Morton, of the Stevens Institute of Technology, strongly recommends the instrument in question, which was originally invented by Mr. E. A. Uehling, and has been finally developed by him in conjunction with Mr. Alfred Steinbart. Its operation depends on the action known as "effusion;" being the passing of a gas through a minute aperture in a thin plate. Let us suppose, says Dr. Morton, that we have a closed vessel through which a current of gas is forced or drawn by a constant pressure, and that the entrance and exit openings are minute apertures of the same size. In such a case the differences of pressure causing the flow through the two apertures will be, roughly speaking, equal; or in other words, the available force will be divided, or divide itself, between the two. Thus, suppose a certain pressure is available to force the gas through the apparatus, this will at first be all available to drive the gas into the vessel. But the pressure within will at once begin to rise, because the air will enter faster than it goes out, until the difference of pressure between the gas in the interior of the vessel and the space into which it is delivered is effectively equal to the difference between the pressure inside and that in the space from which it enters. When this condition is established, the gas will pass out of the vessel as fast as it enters; and thus the pressure inside will be constant. Suppose further that certain arrangements are made whereby the gas forced in is heated at the time of entrance, but cooled within, so as to leave at an unchanged temperature. In this case it is found that, the density of the heated gas being reduced by its increase of temperature, the mass flowing in during a given time will be less, while—the outflow temperature being kept constant—more gas will pass out than comes in, until by this means the internal pressure is reduced sufficiently to compensate for the diminished supply. The practical effect of all this is that a rise in temperature of the entering gas will cause a fall of pressure within the vessel; and this change can be directly observed by a gauge connected with it, either on the spot or at a considerable distance. The instrument constructed upon this principle is said to be capable of measuring temperatures up to the melting-point of platinum, and down to that of the solidification of air.

Hints for Protection from Lightning.

In a report issued during the summer by the United States Department of Agriculture, Mr. Alexander M'Adie gives an account of the statistics compiled respecting the situation, &c., of buildings struck by lightning, and also of the best methods to be employed for the protection of buildings from lightning. These statistics bring out very clearly the decrease of liability to damage from lightning in thickly populated districts. In fact, it may be said, in general, that the risk in the country is five times as great as in a city. Mr. M'Adie strongly advises that if lightning conductors, at any part of their path, go near gas or water mains, they should be connected together. Still he holds that independent ground connections are better than connections to gas or water pipes. Clusters of points, or groups of two or three points along the ridge of a roof, are recommended; the points to be plated. Chain or linked conductors are of little or no use. Finally, Mr. M'Adie agrees with the dictum of M. d'Arsonval, who teaches that persons struck by lightning should be treated like the apparently drowned, by persistent attempts to restore respiration. Lightning may kill instantly by effecting lesion or destruction of the tissues, in which event the phenomena is not likely to be misunderstood. It may also kill by exciting the nerve centres, producing arrest of breathing and syncope, but without doing material injury. It is in the latter class of cases that artificial restoration or respiration is indicated. M. d'Arsonval has known of a man who was recovered in this way, after a current of at least 4500 volts had been passed for some minutes through his body.

Prizes for Smoke Prevention.—The Municipal Council of Paris have opened competitions for the best means of suppressing or diminishing the smoke of cities. To the author of the best memoir on the subject, the sum of 10,000 frs. will be given; and two other prizes will be awarded of 5000 frs. and 2000 frs. respectively. The memoirs must be sent in before Nov. 1 next.

A Reduced Duty on Petroleum.—Last Saturday, a new tariff measure came into force in Russia for facilitating the competition of Russian with American petroleum in the Russo-Prussian frontier district. As from that date, purified or distilled petroleum exported *vid* Baku, Batoum, Odessa, Tosnovize, or Graniza, is no longer to be subject to the higher internal duties, but to the export tariff; and instead of 34·09 copecks as hitherto, only 24·09 copecks will be levied per pood.

The Autumn Meeting of the Incorporated Institution of Gas Engineers.—The programme arranged by Mr. Alfred Colson, M.Inst.C.E., for the autumn meeting of the Institution, of which he is President, gives promise of very full and interesting occupation at Leicester for the Tuesday and Wednesday of next week. The proceedings are to commence as early as 9.30 on Tuesday, with a reception by the Mayor (Mr. Israel Hart) and the members of the Corporation in the Council Chamber of the Town Hall. After this the party will drive to the Wheat Sheaf Works—the boot and shoe manufactory belonging to the Co-operative Wholesale Society, Limited. After another short drive, the Corporation Gas-Works in the Aylestone Road will be reached. Here the company will be met by Alderman Lennard (the Chairman), the Vice-Chairman, and the other members of the Committee, and the Works Superintendents, under whose direction an inspection of the gas, chemical, and electric lighting works of the Corporation will be made. During the visit, it is proposed to give a short demonstration by the Gas Department Ambulance Division, who are the present holders of the Leicester Challenge Shield. There will next be a luncheon, at the invitation of the President, in the workmen's reading and recreation rooms. Afterwards the spinning-mills of Messrs. Fielding and Johnson will be inspected; and the drive will be continued to the hosiery manufactory of Messrs. Raven and Co. A return to town will be made by about six o'clock. For the evening, it is proposed to pay a visit to the Art Gallery and Town Museum, in New Walk; and for those desirous of seeing them, the electric lighting fittings and apparatus show-rooms attached to the Millstone Lane Gas Offices will be open. The following day the President has invited the members to visit the "Dukeries"—the seats of the Duke of Portland, the Duke of Newcastle, and Earl Manvers. A start will be made by the eight o'clock train from Leicester; and, on reaching Cresswell, there will be a drive through Welbeck Park to Clumber and Thoresby. The party will lunch with the President at the Royal Oak Hotel, Edwinstowe, soon after one o'clock; and subsequently there will be a drive in Sherwood Forest to Mansfield, in time to catch the 4.20 Midland train for Nottingham and Leicester, reaching the former place soon after five, and Leicester at six o'clock.

COMMUNICATED ARTICLES.

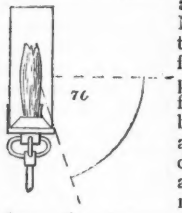
ILLUMINATING POWER AND ILLUMINATING EFFECT.

By J. T. Sheard, F.C.S.

SECOND ARTICLE.

I come now to Mr. Newbigging's second proposition—that the illuminating power recorded by the photometer is not a reliable indication of the illuminating value of the gas tested; or, in other words, that illuminating power and illuminating effect are not synonymous terms. The proposition may be interpreted in two senses. It may mean that of two gas-burners compared, the one which yields the higher result in the photometer will not necessarily be equally superior to the other as an illuminating agent; or it may mean that a gas giving a high photometric test by the standard burner, may not be equally as efficient when burnt in the ordinary appliances of the consumer. I take it that Mr. Newbigging had both interpretations in mind. In illustration of the latter meaning, there is the oft-repeated comparison between the generally miserable street and shop lighting of the Scottish towns, with their 30-candle gas, and the brilliant illumination of southern towns, with gas of only from 14 to 16 candles.

To illustrate the former meaning, I may adduce the following experiment. The effect was tried of employing a standard testing burner (the No. 1 London Argand) to illuminate an apartment, hitherto satisfactorily lighted by a flat-flame governor burner—the naked flame being employed in each case. According to the photometer, the Argand was affording an actual illuminating power greater by 12 per cent. than the flat-flame, with a smaller consumption; yet the alteration was immediately noted to be, not merely no improvement, but the reverse. Struck by the result, so different to what might have been expected, I set about to account for it. I found that the walls of the apartment were really better lighted by the Argand than by the flat-flame—in fact, the light given off in a horizontal direction agreed in practice with the indications of the photometer. But the effect of the experiment had been judged from the position usually occupied in reading or working—viz., within an area enclosed by a line drawn from the tip of the burner at an angle of about 40° below the horizontal. Now it is evident, on a moment's thought, that the light given off in a downward direction from an Argand flame must be much less, proportionately to the total radiation, than from a flat-flame. On plotting out the problem, as in the diagram, we see that at an angle of about 70° below the horizontal the direct rays from less than one-half the flame are received. The experiments on the illuminating power radiated at different angles from the source of illumination, carried out by Mr. W. J. Dibdin, F.I.C., F.C.S., with his improved radial photometer, bear directly on this point.



Mr. Dibdin determined the illuminating power of a number of gas-flames at each interval of 10° above and below the horizontal plane of the burner. An analysis of his results throws much light on the subject under discussion, and is quite sufficient to explain the seeming anomaly in the experiment I have quoted. Thus, if we take the mean illuminating power obtained at all the different angles from directly above to directly below the flame to represent the real extent of illumination afforded, his experiments show that, with Argand burners, this amounts to from 82 to 92 per cent. of the illuminating power in a horizontal direction; whereas, with flat-flame burners, it amounts to from 98 to 106·5 per cent. In other words, the duty actually obtained from flat-flame burners is higher than is indicated by the ordinary photometric test; while that from Argand burners is very much lower. If the lighting above the horizontal line be ignored, the comparison is still more in favour of the flat-flame burner; being as 74 per cent. for the Argand, to 105 per cent. for the flat flame. The above remarks refer to the employment of naked flames. If we consider the effect of globes (which should be taken into account in any estimate of the actual illumination obtained by the consumer), the remarks have further significance.

On this matter, the late Mr. F. W. Hartley carried out an important investigation in 1881. The conclusion he arrived at as the teaching of his experiments, so far as they concern us in this inquiry, may be summarized as follows: When the lighting below the horizontal plane of the burner only is considered, the effect of globes on Argand flames is to *reduce* the power of the light from 3 per cent. with clear glass to 23 per cent. with opal; while the effect of globes on flat flames is to *increase* the power of the light by from 6 to 23 per cent. Seeing that gas lighting is judged, in great measure, as it appeals to the eye *below* the level of the burners, it thus appears that the actual illumination afforded by flat-flame burners, either naked or shielded by means of globes, is much greater than is to be inferred simply from the results of their testing on the ordinary photometer. And, further, it is shown that, as regards illuminating effect in contrast to illuminating power, flat-flame burners, which are so universally employed, are much more efficient than Argands. All this goes to justify the contention that *illuminating power* and *illuminating effect* are terms of different import. At the same time, it is seen that there is an absolute relation between the two, although its precise character and extent may not be easily arrived at. Still, it is well to feel satisfied that, in this matter, we have no recondite and hitherto unrevealed laws to search out, but that the fundamental laws of light are competent, when properly applied, to explain what only our misapprehension or but partial application of established facts has made to appear inexplicable.

There is another consideration which helps to explain the anomaly of high illuminating effect with low illuminating power, and *vice versâ*. In towns supplied with gas of low illuminating power, it will naturally be burnt in larger flames—for the ordinary consumer, untroubled by problems of illuminating effect *versus* illuminating power, and heedless of any standard of quality, simply turns on sufficient gas or obtains burners large enough to give him the amount of illumination he requires—thus obtaining at once economical combustion and better lighting by the employment of larger surfaces of luminosity. Where, however, a high standard exists, small flames will be generally employed for two reasons—because less gas is needed to yield the same candle power at the centre of illumination, and because of the liability of a large flame to smoke.

Mr. Newbigging properly lays stress upon the necessity for completely freeing low-quality gas from carbonic acid. The importance of this matter to the consumer is not generally known. In a series of experiments which I carried out on the subject in the year 1887,* I showed that the deteriorating effect of carbonic acid upon the illuminating power of gas-flames was more than twice as great with flat-flame as with Argand burners; and that the percentage deterioration increased as the illuminating power of the gas diminished. While the presence of 1 per cent. of the impurity in gas might affect the illuminating power in the standard burner to the extent of barely half a candle, it would show itself in the consumer's flat-flame burner by the loss of more than a candle.

The effect of the opal globe in virtually reducing the *intensity* of a gas-flame, has been already referred to in this controversy. The fact that these globes and shades are widely used, are absolutely necessary with intense lights, and are so satisfactory and pleasing in operation, seems to me strongly to support the argument for low-quality gas. Consciously or not, we strive, in artificial illumination, to imitate the effects of daylight in a room. The flood of the latter, diffusing itself into every corner, and practically obliterating shadow, we can never perfectly imitate; but it will be seen, when properly looked into, that this shielding of artificial lights by translucent screens is an effort in that direction. The extremes of contrast between light and dark are reduced; and a more pleasing illumination is produced, notwithstanding that the total amount of light is diminished—a portion being quenched in the imperfectly transparent screen. Were it not for this consideration—if, in short, a small luminous surface of high intensity were as efficient an illuminator as a larger one of lower intensity—the competition of mineral oil would undoubtedly be much more strongly felt than it is. The improved oil-lamps which are placed on the market in so abundant variety, of artistic design, and withal so low in price, develop a very powerful light at low cost; but the intensity of the light is so high, that it must be very greatly reduced by the use of shades before it can be comfortably borne by the eye. Attempt to illuminate a room by the naked flame of such lamps, and it will be found impossible to do it satisfactorily (although the eye may not see the flames themselves), without employing such a number as to raise the general illumination to a much higher standard than is necessary. For instance, such a lamp, giving an illuminating power (tested horizontally) of nearly 30 candles, was placed in the centre of a room some 12 feet square. For the purpose of reading or writing, the effect, so long as they eye was shielded from the direct flame, was exceedingly good; but, for general illumination of the room, the experiment was an utter failure, a far better and more pleasing effect being given by one flat-flame burner developing only some 16-candle power.

With a word on the question of *quantity* and *intensity* of luminosity, I will draw to a close. The subject is not one of the simplest. In connection with coal-gas flames, it is more complicated than with other light sources; and it may be, as Mr. Newbigging suggests, we have something yet to learn about it. According to Frankland, the luminosity of gas-flames is dependent upon (1) "the amount and also the quality of the dense hydrocarbon vapours in the shell of combustion of the flame; and (2) the temperature to which these dense hydrocarbon vapours are heated." In the language of the undulatory theory, the production of light by such flames is due to the vibratory motion of these vapours, at sufficiently high temperature, setting up a series of waves in the universal ether, which radiate in all directions through space, until they meet with, and are quenched by, some opaque body. *Quantity* of light will therefore be determined by the amount of luminous surface; *intensity*, by the average temperature at which it exists. Now we know that, besides those dense hydrocarbons which are the source of light, there exist in the flame many other combustible substances—the former, indeed, being very slight in amount compared to the latter. We are therefore justified in supposing that the actually luminous portion of the flame forms but a

* See JOURNAL, Vol. L., p. 493.

part, large or small, of the whole surface of the flame. In other words, light is not directly radiated from every portion of the apparently luminous flame, but only from detached points or areas of it, whose rapid motion, continuous succession, and proximity to each other, give to the eye the appearance of a continuous surface of luminosity.

Now if this be a correct explanation, when we burn gas containg a larger proportion of light-yielding hydrocarbons, the flame will contain, in each unit of surface, more luminous points or, in other words, more centres of radiation of light waves. Would not this be an increase of *quantity* of light (assuming the same size of flame to be maintained), as well as an increase of *intensity*, through the higher temperature attained? To the eye, however, the effect would be one of increased *intensity* only, since the luminous surface remains apparently the same in continuity as before. Or does the effect consist in providing a greater *thickness* or *depth* of light-producing centres, the surface remaining the same? In this case, intensity only would in reality, as well as in appearance, be increased. Whichever may be the more correct explanation, it seems to me that, for all practical purposes of photometry or illumination, we are justified in considering *quantity* as the surface of luminosity, and *intensity* as the illuminating power per unit of surface.

THE REGULATIONS FOR THE SUPPLY OF ELECTRICITY, COMPARED WITH THOSE FOR THE SUPPLY OF GAS.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

A comparison between the regulations affecting supply now usually adopted in Provisional Orders authorizing the sale of electricity for lighting, with those for the supply of gas, as inserted in the Gas-Works Clauses (1847) Amendment Act, 1871, shows that the latter have really formed the foundation for the former. Entire phrases and sentences have been transferred from the earlier to the later Acts. It is further evident that electricians, profiting by the experiences which have fallen to the lot of gas undertakings, have requested, and been able to obtain, better terms than those granted by the 1871 Act to gas-works. At the present time, when active endeavours are being made to bring electric lighting into competition with gas, it may be interesting to examine these conditions in detail; and it is not too much to claim that any privilege granted to electric light companies, but either closed or denied to gas companies, gives an unfair advantage to electricity, of which those interested in gas have a right to complain.

The various enactments by which the supply of gas to the public is controlled and regulated were drafted at a time when the suppliers of gas were supposed to have a clear field, so far as the distribution of a lighting agent from a manufacturing or producing station was concerned. The terms in which they are worded, clearly indicate that they aimed at the control of a business that was to a very great extent a monopoly. Gas was regarded as one of the necessities of civilized life—something like the water supply; and the right to cut off or discontinue it was thought to be of such importance that it was limited in various ways, while at the same time penalties were introduced for deficiencies either in the quantity or the quality of the supply. The value of the monopoly represented by the right to supply gas was always heavily laboured by the representatives of the public, whenever additional or extended powers were sought. It is relied upon as a valuable weapon at all meetings of the "gas consumers' indignation" kind; and it has also been brought out as one of the reasons why the gas supply should be in the hands of the local authorities.

This idea of a monopoly has tempered the tone of the regulations under which gas undertakings are at present controlled, to such an extent that anything in the way of the successful establishment of a competitor would operate to their disadvantage in several ways, apart from any question of mere loss of business. Such a state of things as that which would obtain if the electric light companies now being established should succeed in their endeavours to secure the public lighting and a substantial share of the private lighting, was at that time beyond the regions of practical possibility. The electricians, with the fact before them of having to compete with established interests, have not been hampered with this cry of "monopoly;" and they have, on that account also, been able to obtain better terms from Parliament than the gas undertakings could get. It follows that anything which tends to reduce the "monopolist" powers, of which so much has been made, should also be attended with a corresponding reduction in the severity of the clauses that were inserted for the purpose of limiting them. In other words, the position of gas undertakings, as monopolies, is now being changed; and had such changes been foreseen at the time when the present obligations were drafted, it is probable that modifications would have been allowed. It is too much to expect that those who clamoured so loudly about "binding down a strong monopoly" will retract their position, according to alterations in circumstances, and propose to relieve the burdens which they assisted in laying on. Any movement in the direction of obtaining relief must come from the gas undertakings.

The terms upon which gas is to be supplied, and the powers possessed by undertakings in respect to their dealings with their customers, will be found in the 1871 Act. Gas companies are bound to furnish a constant supply to all who require it. If this referred to regular consumption only, it would not be so hard; but it also renders them liable to be *in readiness* to supply. If a customer choses to take only 100 cubic feet per annum, he has a right of damages against the company if they are not prepared to supply at any moment. Summarizing the regulations in ordinary language, they show that any person may demand a supply of gas for premises situated within 25 yards of any main-pipe belonging to the company, "or such other distance as may be prescribed in the Special Act." When so prescribed, it is never less than 25, but ranges up to 50 yards. There are the usual clauses as to written notice and security for payment; and also a stipulation that the consumer should bear the cost of pipes laid in private ground, or in any case for all after the first 30 feet. Further, the undertakers may require a guarantee for at least two years' consumption of gas, amounting in cash value to not less than 20 per cent. per annum on the cost incurred by them in laying the service. This clause is so vague as to be utterly useless in practice, apart from the fact that the cost of a service-pipe is now so low as to render the guarantee absurdly small. Suppose that a customer applies for a supply of gas, and there is good reason to believe that the consumption will be small, irregular, or uncertain. All that can be done is to demand a guarantee, on the above terms, for a yearly consumption equal to 20 per cent. on the cost of supplying and laying any length up to 30 feet of service-pipe. Possibly only 10 to 15 feet of pipe may be needed, or the customer could evade the guarantee by bearing the whole cost of the service. But this guarantee, such as it is, only holds good for two years. The expression used—"at least two years"—certainly affords some ground for extending it beyond that period, if thought desirable; but it is not clear on the point. Whatever the period over which the guarantee may extend, however, the position of the gas suppliers at the end of that time is somewhat puzzling. Have they no further powers as regards guarantee? or could they threaten to discontinue the supply, and so force a fresh application and a fresh agreement? However this may be, it is evident that the guarantee has no bearing whatever on the supply of gas, but is simply a partial protection against loss on laying the service-pipe.

The result of this is that the gas company are bound to be ready to supply, even if the consumer uses no gas from one year's end to the other; and all gas undertakings are burdened with an unprofitable class of customers, including those who use very small quantities, and perhaps only during one week, or even one day, in the year, and those who do not use any for irregular periods, or throughout the summer. Such customers are a loss to the concern, because every customer's share of certain expenses is entirely irrespective of the quantity of gas used by him. The meter inspector must inspect every meter, and the rental clerk enter up the reading. A certain share of the unaccounted-for gas must be placed to the credit of every service and meter, apart from the quantity used through them. If only 100 cubic feet is used, a bill must be prepared, and the collector must call. Even as regards very small accounts, it is well known that a large proportion of small consumers means an equally large proportion of unaccounted-for gas. If the matter was thoroughly inquired into, it would be found that the absence of anything in the way of a minimum charge for gas entails a considerable loss on the suppliers. The question has never been raised yet, because no urgent necessity has arisen for doing so; nor have I heard of a case where a guarantee of minimum consumption was demanded, except in connection with special circumstances, such as extending the service or main beyond the prescribed limit.

The electricians have secured a very substantial protection against losses of this sort, by the insertion in their Provisional Orders of a clause which runs something like this: "They shall be entitled to charge at the following rates per quarter: For any amount up to 20 units, 13s. 4d.; and for each unit over 20 units, 8d." The price named, of course, varies according to each case; but the principle is that a consumer *must pay for 20 units each quarter*, whether he uses it or not. Even during the summer quarter, not less than this amount must be paid for. Applying this rule to the case of gas, 20 units may be taken as representing 2000 cubic feet. Every gas company has 5, 10, or even a larger percentage of customers on its books who do not pay for over 1000 cubic feet in the summer quarters at any rate. The right to charge a minimum of 2000 cubic feet per quarter, would mean an increase of income sufficient to warrant a reduction in price; and gas companies are placed at an unfair disadvantage, if such a privilege is allowed to their competitors but denied to themselves.

Of course, there is the objection that it is unfair to charge for more than is actually supplied; but if the question is fairly examined, in the light of the facts just mentioned, it will be seen that a minimum charge is a perfectly fair one. It represents the cost of being ready to supply, and interest, maintenance, &c., on the plant concerned in this responsibility. In the case of water companies, there is a minimum charge. If we hire a horse and brougham, the owner expects payment whether we are using it all the time or not. Against the fairness of a minimum charge, it has been urged that a shopman might as well charge all his neighbours for keeping his shop open, as he is ready to supply whether they chose to go in and buy or not;

but the case is not parallel. The neighbours who never deal with him have never put him to any expense. To get a fair representation, we must assume that the shopman is compelled by law to keep a space at his counter ready for the use of each neighbour, and, further, to be liable to penalties if the individual turns up at any time without notice, and finds his place filled. No retail tradesman would expect to provide convenience in this way, without a right to charge. In directing attention, therefore, to the minimum charge, there is no intention of hinting that the electricians have secured more than their fair rights; but what is sauce for electricity is also sauce for gas.

A point in connection with the charge for public lighting may next receive attention. The 1871 Act provides that the price of gas supplied to the public lamps may be settled by agreement, or, in case of difference, by arbitration; regard being had to the circumstances of the case and the price charged to private consumers. So far, this is quite as much as could be expected; but in many Private Acts it has been over-ridden by a condition, inserted under pressure at the demand of the local authority, to the effect that public lamps should be supplied at the lowest price charged to any consumer. Such a stipulation was brought forward and approved in the spirit already noticed—that of regulating a monopoly—and evidently with regard to the probability that the whole of the streets and public spaces would be lighted by gas, causing the aggregate consumption to be larger than that of any private customer. But it is a strong point with the electric lighting companies to secure, not the whole, but a selection including the cream of the public lighting; and the same authorities who forced the above obligation on gas companies, are perfectly willing to favour electricity in this respect. If their endeavours are attended with success, the gas company lose all the high-power lamps, and a large proportion of the remainder; being left with a comparatively small and widely distributed consumption in the by-lanes and outskirts. The loss of a privilege should, in common fairness, carry with it the removing of an obligation bearing upon that privilege; and the hardship involved in the obligation to supply the leavings of their competitors at the old rate, is too obvious to need further amplification.

We have, however, not yet exhausted the advantages afforded to electricity as compared with gas. The gas companies' powers are usually supposed to cease at the meter; and the consumer can do as he pleases beyond it. If he chooses to vary the pressure in the mains in the vicinity, by suddenly and frequently alterating the rate of his consumption, the company have no remedy. He may put 100 lights on, or cut them off without notice; and I have heard it alleged by a solicitor that the gas company have no right to ask how many lights are in use. The same gentleman, by the way, has since proved perfectly willing to allow an electric lighting company the right to inspect the whole of his wires and lights as often as they choose. But clause 21 of the 1871 Act seems to give power to enter the consumer's premises and inspect the fittings at all reasonable times. This clause may be useful in case of a disputed account, or where a meter has failed to register; but it is not often used, and many undertakings have preferred to drop it entirely for the sake of working peaceably with their customers. This power to inspect, whatever it may be worth, evidently has reference only to questions relating to the quantity of gas consumed, and the charge for the same. There is no right to raise a question as to the suitability or efficiency of any appliance in use.

The following extracts from Electric Lighting Provisional Orders, however, point to a different footing: "Provided also that if the owner or occupier . . . uses any form of lamp or burner, or uses the energy supplied to him . . . so as to unduly or improperly interfere with the efficient supply of energy to any other body or person, . . . the undertakers may discontinue to supply energy to such premises. The undertakers shall not be required to supply any premises. unless they are reasonably satisfied that the electric fittings are in good order, and not calculated to affect injuriously the use of energy." These clauses admit a large extent of control right up to the point of consumption. They are further of use in aiding the electric company to control the supply of fittings, which is a very important branch of the business, and in many cases furnishes (at present, at any rate) the chief part of the profits. Persons will naturally hesitate about placing an order for electric fittings with a local tradesman, when there is a risk that the company may condemn the whole. The important feature, however, is that, whereas gas companies are helpless in the matter of controlling wasteful or careless usage, the suppliers of electricity have, very wisely, secured considerable powers in this direction.

If a gas consumer uses burners which obtain, let us say, only one-fourth of the value that might be secured by the use of proper appliances, and then goes away and states that the gas is four times as costly as it need be, or if he uses cheap and inferior fittings, with the usual result of constant leakage (which is also placed to the credit, or rather to the discredit of the gas company), there is no remedy. Perhaps it may be said that the consumer is amenable to reason, and will not wilfully waste gas; but the proportion of dirty iron burners, small pipes, and gingerbread fittings to be found in use in any room, testifies to the fact that the consumer is either too indolent, or that he regards the advice of the gas company as more likely to benefit them than himself. Possibly he prefers his own ideas or those of his gas-fitter; finding it costs nothing to grumble, while new appliances are not to be had on such good terms. Whatever the reason may be, he keeps on in the same old way. But the suppliers of electric light, under corresponding circumstances, have the right to say that the fittings are not in good order, and to refuse the supply. They secure, in effect, the right of insisting that their product shall be properly used; and they do not object to compare the results derived under such circumstances with those obtained by the medium of the dirty iron burners, &c., for gas.

Lastly, there is the fact that the electricians have a unit of price that is really a unit. For all practical purposes, 100 cubic feet is the unit of price for gas, although it is usually expressed at per 1000 feet, and the latter rate is the one stated on the bills. There is much to be said in favour of one plain unit for gas such as electricians have; and 100 cubic feet would do well for the purpose, under some distinctive title. Suppose it was simply called a "hundred." Such a statement as "109 hundreds at 4d. per 100" is simpler and more readily understandable by small tradesmen than 10,900 cubic feet at 3s. 4d. per 1000;" and it carries a better impression to have a low-priced unit than one that runs into shillings and pence.

At present the cost of electricity delivered at the consumer's residence, as compared with gas, is so great as to prohibit anything in the way of serious competition; and the matters above mentioned are of no actual importance in practice. If, however, circumstances so changed as to enable it to compete with gas in point of price, the case would be different, and the need for something like equality in regard to legal obligations would be apparent.

TECHNICAL RECORD.

SOUTH-WEST OF ENGLAND DISTRICT ASSOCIATION OF GAS MANAGERS.

The members of the above Association held their Half-Yearly Meeting at Frome last Tuesday. The programme drawn up by the Committee (who were actively assisted in making their arrangements by Mr. H. F. Vincent, the Manager of the Frome Gas Company) included little of a business nature—it having been determined to devote the greater part of the day to pleasure; and to this departure from the usual order of things, the members, judging by the number present, did not object. Brilliant weather favoured the plans of the Committee; and the outing was thoroughly enjoyed by all who took part in it.

The members assembled at noon at Cooper's Auction Mart, for the purpose of disposing of the routine business appertaining to the autumn meeting, and to consider the question of the reduction of the time-guarantee for prepayment gas-meters. The PRESIDENT (Mr. Norton H. Humphrys, of Salisbury) occupied the chair.

The PRESIDENT, in opening the proceedings, said he was pleased to inform the members that the Association had met with the utmost cordiality from the Directors of the Frome Gas Company, who had done all they could to make their visit that day a success and to add to their enjoyment. Three of the Directors were present; and one of them—Mr. Ames—desired to say a few words of welcome.

Mr. E. G. AMES said he was very sorry that the Chairman of the Company was absent from the town that day; but, that being so, the duty had fallen upon him and two of his colleagues—Dr. E. Cockey and Mr. C. J. Sage—to express the great pleasure which they had in receiving the Association at Frome. He understood that the meeting was to take more of a recreative than a business character; but if any of the members were able to visit the gas-works, any suggestions which they could make by way of improvement Mr. Vincent and the Directors would be glad to receive.

The PRESIDENT said that, in accordance with their usual custom, the members had the pleasure of recognizing the kindness of the Directors of the Gas Company by carrying a unanimous vote of thanks to them for the courtesy extended to the Association. Their Association was one that worked, as a rule, in the utmost cordiality and sympathy with the directors of gas companies. He was proud to say that they had several friends among the directors of the various companies; and it was a great pleasure to the members that this was so—for they would agree with him when he said that, for success in the management of a gas undertaking, they should be a thoroughly happy family all round, and that there should be the utmost sympathy between the directors and their manager. He proposed a vote of thanks to the Directors of the Frome Gas Company; and, in doing so, he specially mentioned the name of Dr. Cockey, whose brothers in years gone by some of the members knew very well indeed.

Mr. W. A. PADFIELD (Exeter) seconded the vote of thanks; and, in the course of a few remarks, he said that they all felt that the interests of gas managers were bound up with those of the companies. It was necessary that they should all work together, and that the directors should have absolute faith in

their managers, in order that they might progress with the times. He had no doubt that this was the policy of the Frome Gas Company; and he hoped that the members would have the pleasure of meeting the Directors again on a future occasion.

The motion having been carried,

Dr. COCKEY responded, and thanked the President for his kind reference to himself and his brothers.

CONFIRMATION OF MINUTES.

The HON. SECRETARY and TREASURER (Mr. H. Sainsbury, of Trowbridge) then submitted the minutes of the meeting held at Salisbury in April last; and on the motion of the PRESIDENT, seconded by Mr. W. HIGGS (Basingstoke), they were confirmed.

ANNUAL ACCOUNTS.

The HON. SECRETARY presented his accounts for the past year. They showed that the receipts amounted to £47 15s. 6d., which, with the balance of £8 6s. 1d. brought forward, made £56 1s. 7d. The disbursements came to £21 6s. 5d.; leaving £34 15s. 2d. in hand.

On the motion of the PRESIDENT, seconded by Mr. J. PHELPS (Marlborough), the accounts were adopted.

MEMBERSHIP LOSSES.

The PRESIDENT announced that during the year there had been one resignation—that of Mr. E. D. Sapey, of Horsham—and they had lost by death Mr. Joseph Reed, of Newport (I. of W.), who latterly, on account of advancing age, had not very often appeared at the meetings, but still they would like to place on record their regret at his decease.

NEW MEMBERS.

On the proposition of the PRESIDENT, seconded by Mr. J. S. INESON (Ventnor), the names of Mr. F. G. Cockey, of Newport, and Mr. Clark Jeffreys, of Portland, were added to the roll of members.

PREPAYMENT METERS AND MAKERS' GUARANTEES.

The PRESIDENT said, as the members were aware, a suggestion had emanated from the Secretary of the Eastern Counties' Association (Mr. H. Wimhurst) that the action of the makers of prepayment meters in reducing the period of guarantee from five years to one year should be resisted. The matter had been brought before the Committee, who thought it was a question upon which the members should express an opinion. He need not say that anything to do with meters—whether prepayment or otherwise—should be carefully considered, as meters were an important part of their plant. The meter was really the criterion by which they found out how much they were to receive; and he thought it would be generally agreed that the meters should be—he supposed he ought not to say they must be—above suspicion, or, at all events, they should be as far above suspicion as they could be made. They had not yet tried prepayment meters at Salisbury; and therefore he would ask those who had had actual practical experience of them to express their views. Before they did so, however, perhaps he had better read a resolution on the subject which was passed by the Committee at their meeting on Aug. 16. The minute containing the resolution was as follows: "Prepayment Meter Guarantee.—A letter from the Hon. Secretary of the Eastern Counties Association was read by the Secretary; and the following resolution, proposed by Mr. Padfield, and seconded by Mr. Shepherd, was unanimously passed: 'That this Committee are unanimously of opinion that, having in view the desire for the successful working of the prepayment meter, the interest of maker and consumer will be best served by a five years' guarantee as in ordinary meters.'"

Mr. S. W. DURKIN (Southampton) remarked that he had had no experience with "penny-in-the-slot" meters. But from what he gathered from the technical press, the meter makers had been rushed into this system; and he did not think that, until very recently, they had been able to give any guarantee at all, because they did not know how the meters would turn out. It seemed to him to be entirely a matter of readjustment of the prices charged for the meters, because, if the makers were paid a proper figure, they could give a five years' guarantee. They declared that they had made a loss on the meters; and they all knew that, in starting a new system, there was sure to be some loss before matters could be put right. He presumed that the makers would see the feeling that had been expressed at the various Association meetings; and then perhaps they would agree to give the usual guarantee of five years.

Mr. J. LOWE (Weymouth) was not prepared to take such a lenient view of the matter as Mr. Durkin, seeing that these prepayment meters were nothing more nor less than the meters they had known from their youth up, with the prepayment arrangement added; and the fact that the makers declined to give the same number of years' guarantee to the meter with this attachment was evidence of its weakness, and not of its strength. If these meters were to be successful, they must have a guarantee of their accuracy in working. A meter which was not accurate gave gas managers much trouble among their customers; and until the makers woke up to the fact that they wanted a meter which was free from suspicion, so long would the "penny-in-the-slot" meters hang fire. He was particularly anxious to tap the class who consumed gas under the prepayment system; but until a reliable meter was placed in their hands, he should hesitate to introduce the system.

Mr. G. I. GOUGH (Calne) said he agreed with Mr. Lowe. The meter makers had dealt unfairly with the purchasers of prepayment meters, inasmuch as they had withdrawn the guarantee on the meter itself. Really two questions arose here—First, the question of guaranteeing the prepayment apparatus; and secondly, the guaranteeing of the meter proper. While there might be some reason for reducing the guarantee for the prepayment arrangement, he saw no reason for interfering with the guarantee for the meter itself. Still, in his opinion, the whole of the meter, including the prepayment portion, should be guaranteed by the makers for five years.

The PRESIDENT remarked that he was delighted to see Mr. James W. Helps among them that day. Many of the members would remember the meeting the Association held at Weston-super-Mare, on which occasion they received a great deal of attention and kindness from Mr. Helps, who was at that time the Engineer of the works in that town. He afterwards went into a larger sphere; and had since been doing good work as the Honorary Secretary of the Southern District Association of Gas Engineers and Managers. He (the President) was glad to have this opportunity of assuring him that the members had not forgotten him, and to ask him to favour them with his views on this prepayment meter question.

Mr. J. W. HELPS (Croydon) said it was very gratifying to him to listen to such words as those which had just fallen from the President. He looked back with a great deal of pleasure to the time he had spent at the meetings of the South-West Association; and he was glad that he had found an opportunity of redeeming a promise he had made to the President that he would attend another meeting. With regard to the question under consideration, he took it that the discussion was upon two points—first, as to the prepayment meter system itself; and, secondly, as to the guarantee. He had had some four or five years' experience with prepayment meters. Perhaps he ought to ask the members not to think that by prepayment meters he only meant those which were commonly known as the "penny-in-the slot" meters. At Croydon, they used a meter which had no slot; but, when the consumer wanted gas, it required a man from the Company to turn the index with a key to the amount of gas paid for. Then, after a short interval, the man called again, and turned on a further supply. Many people had raised the objection that, under this system, the consumer might be left in darkness. With regard to this point, he might say that at Croydon, they had something like a thousand consumers, or about 14 per cent. of their total number, supplied with gas on this system; and it was really wonderful how very few instances indeed they had of a house being put in darkness through the supply running out. They had what he might term a system of storeage in connection with the meters. In other words, when they obtained a new customer, they inquired of him how much gas he was likely to burn in a certain time. Supposing it was 300 cubic feet, they set the index for that amount; and at the end of a week or so, the Company's man called again, and perhaps found the consumer had 120 or 150 feet still due to him. This quantity was then made up again to 300 feet—the necessary amount of money being, of course, handed to the official. In this way, they gave the consumer a kind of margin or store. They found that this system paid the Company very well indeed. They charged 2d. a week for the rent of the meters and fittings, boiling-ring, &c., which cost altogether a little under £4; and they obtained 12 per cent. on the capital outlay. The average consumption per meter was from 16,000 to 18,000 cubic feet per annum; and the net profit realized in a year was something like 16s. 8d. or 17s. per consumer. By this means, they had tapped a source of revenue which they would never have done in any other way; and a householder could now buy a shilling's worth of gas in the same manner that he would purchase a shilling's worth of oil. Then came the question of the guarantee. It had been remarked by Mr. Durkin that it was simply a matter of £ *s. d.* As he (Mr. Helps) looked at the matter, it might be considered in the same light as life insurance. In fixing the scale of premiums, the insurance company would naturally ask, "What is the rate of mortality among the people?" And the question the members had to consider was, What is the rate of mortality among prepayment meters? If they used a meter in which there was a certain amount of mechanism in excess of what was put into an ordinary one, it naturally somewhat increased what he had termed the rate of mortality; but this did not prove that it was not a suitable meter to employ. He did not think that in his case the question of altering the five years' guarantee had been raised. They paid something more for the prepayment meter—say, 10 or 12 per cent., or whatever it was—than they did for the ordinary ones; and he thought, if gas companies wanted a five years' guarantee, it only meant that they must pay a little more for the meters as an extra premium. It seemed to him that one of the defects of the "penny-in-the-slot" meter was that, the consumer getting his gas in small doles or pennyworths, there was a slight percentage of error on every penny, which was multiplied by twelve on every shilling's worth of gas; and, when they came to take the state of the index at the end of the quarter, it was found that there was a variation between the quantity of gas consumed and that actually paid for—

sometimes as much as 10 or 12 per cent. Where, however, they had a whole shilling's worth of gas paid for at once, they found practically no variation at the end of the quarter. This appeared to him to be an argument against the objection to the sending round of a man at stated intervals to turn on an additional supply of gas; so that there was really no great difference between the two systems. He should like to see a little more prominence given to the meters such as he had described. In his opinion, some gas companies, and especially those in the Metropolis, had been "rushing" these "penny-in-the-slot" meters a little too much; and he had heard of certain companies paying their fitters a bonus of 2s. 6d. for every new consumer brought in. Personally, he thought that, if the pre-payment system was to be of lasting benefit to gas companies, it should be developed quietly, and not rushed in the manner he had indicated.

Mr. W. A. PADFIELD (Exeter) said that Mr. Helps had touched on several important points. He did not appear to have been interfered with on the part of the meter makers with regard to the guarantee; and he (the speaker) did not anticipate that all of them would withdraw the guarantee, because it was evidently a sign of weakness. Then, as to the additional 10 or 15 per cent. on the cost of the meters, he thought the price of the ordinary slot meter was considerably more than that. However, if they carried out the system in the way indicated by Mr. Helps, he believed it would be of immense advantage to gas companies. He agreed with Mr. Helps that some companies were making too great a rush with these meters; and he was of opinion that they should be quietly held in reserve to meet any loss that might happen. They would be a means, for instance, of adjusting dividends; for, taking the number of meters mentioned by Mr. Helps, the profit on them ran up to something like £600 a year, which would be of great assistance in recouping a company their losses in other directions.

Mr. HELPS said he wished to point out that in their case the meter was practically never touched, excepting by the official of the company who adjusted the index; whereas the penny-in-the-slot meters were worked by the consumers themselves. The danger of injury was thus minimized, as there was less chance of the mechanism being damaged by crooked pennies, &c.

Mr. GOUGH asked to be allowed to supplement his previous remarks by saying that at Calne the slot meter system had been successfully adopted; and they had found no instance where a consumer had endeavoured to tamper with a meter. He should like to draw attention to one thing that had struck him during Mr. Helps's observations. It seemed to him that the principle of paying in advance for, and adjusting the meter to, a fixed quantity of gas was a good one; but it appeared to adapt itself to another order of consumer. Their object at Calne was to get hold of the working class; and he did not think the system described by Mr. Helps would obtain with that class of consumer, though he must confess that the meter he had adopted commended itself to him.

Mr. HELPS stated that at Croydon they did not fit up houses on the prepayment system that had a higher rental than £30 a year. They were mostly artizans who went in for the meters.

The PRESIDENT, in closing the discussion, said he did not think it was necessary to pass a resolution on the subject. The expression of their various views he thought was sufficient. These prepayment meters appeared to be a means of getting rid of that difficulty which they all had where there were weekly tenements, the occupants of which were not willing to pay for gas-fittings; and it also overcame the trouble of bad debts. He thought the discussion showed that the members were distinctly in favour of a five years' guarantee.

ELECTION OF OFFICE-BEARERS.

The Scrutineers of the voting-papers (Messrs. Lowe and Brinkworth) next reported that the following gentlemen had been elected to hold office during the ensuing year:—

President—Mr. F. G. Dexter, of Winchester.

Vice-President—Mr. H. Townsend, of Plymouth.

Hon. Secretary and Treasurer—Mr. Norton H. Humphrys, of Salisbury.

Auditor—Mr. W. Higgs, of Basingstoke.

Members of Committee—Mr. T. Giles, of Bridport; Mr. G. I. Gough, of Calne; and Mr. H. F. Vincent, of Frome.

Mr. DEXTER said it was a matter of great gratification to him to be able to thank the members for the opportunity they had given him of proving his interest in the Association. He felt that all of them ought to take some duty as time went on; and although he was very much afraid that his efforts would not be altogether successful during his year of office, he should endeavour to do his best, and should look for the support and kind indulgence of the members.

Mr. HUMPHRYS, in acknowledging the confidence shown by the members in again electing him as Hon. Secretary, stated that this was absolutely the last year he could accept office. He found that, as time went on, duties and responsibilities increased; and he had come to that period of life when one found that there was a limit to what could be done, and he was beginning to realize that he was working close up to that limit. He had thought of completing his official duties at that meeting; but he did not think it well that the acceptance of the presidency should be regarded as a sort of "Chiltern Hundreds" for the Secretary. He therefore decided that he should accept office this year at any rate; and after that he considered the time had arrived when he should retire in favour of some younger member, who could bring more activity to bear upon the work than he should be able to do himself in the future. He thanked the members for their kind indulgence in the past; and he expressed the hope that the Association would prosper in the future.

THE SPRING MEETING.

On the proposition of Mr. DEXTER, seconded by Mr. P. THOMAS (Wellington), it was agreed that the next meeting should be held at Winchester.

VOTES OF THANKS.

The PRESIDENT said the members were about to visit the gas engineering works of Messrs. Cockey and Sons; and he thought they ought to pass a formal vote of thanks to that firm for the kindness and hospitality they were extending to the Association that day.

Mr. DEXTER seconded the motion, which was unanimously agreed to.

Mr. LOWE, in suitable terms, proposed a vote of thanks to the retiring President for the assiduous manner in which he had discharged his duties during the past year.

Mr. GOUGH seconded the proposition, which was supported by Mr. THOMAS HARDICK (Salisbury), and afterwards carried by acclamation.

The PRESIDENT briefly expressed his appreciation of the kind manner in which the members had recognized his services.

This concluded the business proceedings; but, before departing, the members partook of light refreshments which had been kindly provided by the Directors of the Frome Gas Company.

VISIT TO THE WORKS OF MESSRS. COCKEY AND SONS.

At the conclusion of the proceedings reported above, the members visited the works of Messrs. E. Cockey and Sons, Limited, where they were received by the Directors and General Manager. They inspected the various workshops and foundry which have been recently erected upon the Company's freehold land, and which occupy a space of between 6 and 7 acres, and have the advantage of being close to the Great Western Railway Company's North Somerset line, so that all goods can be loaded up into railway-trucks on the premises. The fitting-shop, where the several kinds of machinery required in gas-works are produced, greatly interested the visitors, many of whom were struck by the facilities possessed by the Company for carrying out this class of work expeditiously and with economy. The foundry next claimed attention; and here castings of the usual kind necessary for gas-works were being made. An overhead traveller, driven by an endless rope, and running the entire length of the building, is used; leaving the whole floor area available for the various processes carried out in this department. In the gasholder department, everything seemed to be adapted for constructing gasholders, &c., of the largest dimensions by the most modern methods; and evidence of the firm's ability to do this was afforded by several holders which were to be seen in various stages of manufacture. The whole of the works appeared to be fully employed; and our representative was informed that gasholders and other apparatus are in course of erection by the Company at Malmesbury, Fareham, Sandown, Wellington, Radstock, Salisbury, Sidmouth, Newport, Wells, and other places.

VISIT TO LONGLEAT.

At the conclusion of the inspection of the above works, the party were conveyed by brakes through some most charming scenery, to the stately and historical mansion of the Marquis of Bath, at Longleat. Here the party alighted, and ascended a hill in the park, the top of which has received the pleasing appellation of "Heaven's Gate," and from which spot a fine view can be obtained of the country around. The drive was then continued to Shearwater, which is a beautiful lake, with very picturesque surroundings. The return journey was made by a different route; and Frome was again reached shortly before six o'clock.

Most of the members had accepted an invitation given by the Directors of Messrs. Cockey and Sons, Limited, to dine with them in the evening at the George Hotel. The Chairman of the Company (Mr. W. A. Padfield, of Exeter), occupied the chair; and on his right hand were Mr. Humphrys and Mr. Dexter, the President and President-Elect of the Association. The other members of the Board of the Company were also present, as well as their General Manager (Mr. W. L. Ramsden). At the close of the dinner, a few appropriate toasts were given. Among others, Mr. Padfield proposed "Success to the Association," uniting with it the name of Mr. Henry Sainsbury, of Trowbridge, who has been acting as Hon. Secretary of the Association during Mr. Humphrys' occupancy of the office of President, and who (as shown by our report) now retires, in order to allow Mr. Humphrys to resume his old duties.

WAVERLEY ASSOCIATION OF GAS MANAGERS.

The Half-Yearly Meeting of this Association was held last Thursday at the Royal Hotel, Portobello; Mr. D. Vass, the Manager of the local gas-works, occupying the chair. There was a good attendance; and several subjects of current interest were discussed. The question of the guarantee for prepayment meters first claimed attention; and it was considered that the same period should be allowed as for ordinary meters. The members were next interested by an exhibition of Messrs. R. and A. Main's new gas-fire burner, which, it was claimed by Mr. Docherty (the firm's representative), absolutely prevented the firing-back of the flames.

The question of incandescent gas-lights for outdoor illumination was then discussed; and it was stated by Mr. Galloway that lamps had been fitted up in Portobello and in Nicholson Square, Edinburgh, which burnt 3¼ cubic feet of gas per hour and gave a light of 75-candle power. These had displaced burners consuming 2½ cubic feet per hour, which the Press had been good enough to call mere farthing dips when compared with the incandescent light. The ordinary burners used in shops and houses consumed from 2½ to 2¾ feet per hour, and gave a light of from 5 to 6 candle power; while the new burner consumed 1¾ to 2 feet an hour, and gave a light of 35-candle power. Replying to questions, Mr. Galloway said the lanterns in use were quite suitable if they were of square pattern; and the bye-pass fitted to the lanterns for lighting purposes cost 1s. per year. They did not require to open the lantern at all to light the burner. The mantles cost about 1s. 3d. each; and two mantles in the year was the average they counted upon, though they did not usually run to that.

Enrichment by oil gas was the subject next considered. Mr. W. Thompson, of Musselburgh, reported that he had been using oil to enrich gas for two years; and the system had given great satisfaction. They had no reason to regret going in for it. Mr. W. Whyte, of Penicuik, expressed a similar view; and in answer to questions, he said he sold the coke in a special market at 20s. a ton. Mr. Thomson added that he obtained the same price from bakers in Musselburgh.

The Chairman invited expressions of opinion as to the effects of the coal strike. It had affected them in Portobello to the tune of 4d. per 1000 cubic feet; and if the strike continued, this price would be greatly increased. Mr. W. Blair, of Haddington, stated that, in his case, it had added 1½d. to the cost of production. Coal, however, seemed plentiful; and he had as good a supply as at midwinter, though that purchased over and above what they had contracted for was at greatly enhanced prices. The Chairman thought the coal proprietors should be bound to deliver at the contract prices so long as they had coal at the coal hill. He understood something of the kind had been arranged by the Edinburgh Gas Commissioners. They had not anticipated that the strike was going to stretch out to such a length of time. For his own part, he provided against a six weeks' strike; but before the strike had gone four weeks, they found that they had to get other supplies from another quarter, to keep up the supply of gas. He was glad to say they had been able to do so; but the cost had been far in advance of last year. Mr. J. Black, of North Berwick, said that some of the Glasgow agents had delivered coal to him under their contract; but he had been refused a supply from Fife except at the higher rates. Mr. J. C. Adamson, of Airdrie, thought the only solution of the strike business was to have an ample supply of coals; and Mr. Blair intimated that they intended putting up a store at Haddington which would hold a twelvemonth's supply.

At the close of the discussion, it was agreed to hold the next meeting at Kelso.

The usual dinner took place immediately after the meeting. Mr. Vass again presided; and Mr. G. Taylor, of Jedburgh, acted as croupier. Among the guests was Mr. Robert Mitchell, of Edinburgh, the President of the Incorporated Gas Institute.

THE EFFICIENCY OF INCANDESCENT ELECTRIC LAMPS.

In the course of his Royal Institution lectures on Electric Lamps and Electric Lighting, which are about to be published in collected form, with illustrations, by the *Electrician* Printing and Publishing Company, Dr. J. A. Fleming describes an incandescent electric lamp as a machine for transforming energy from one form—that of an electric current—to another form, which he calls "eye affecting radiation." That is to say, it transforms the electric energy into radiant energy, or energy of ether waves, only a fraction of which can impress the eye as light. This fraction varies from 3 to 7 per cent. of the whole, as determined by suitable experiments, in which the relative amounts of luminous and dark heat sent out by an incandescent lamp in action are separately measured. For example, if an incandescent lamp is immersed in water in a transparent vessel, the water will absorb nearly all the dark, or non-luminous radiation, while permitting a large fraction of the luminous radiation to pass out. By putting the lamp in a photometer, both when in and when out of the water, the fraction of the luminous radiation which is absorbed can be determined. By measuring the rise of temperature of the water which is created by the absorption of the radiation, both when the luminous radiation is allowed to pass out and when it is wholly stopped by blackening the lamp bulb, we can determine the ratio between the amount of the radiation which affects the eye as light and that which cannot affect it at all. A well-devised series of experiments of this kind have been carried out by Mr. E. Merritt, at the Cornell University, U.S.A. The result has been to show that, on an average, about 5 per cent. of the energy supplied to an incandescent lamp in the ordinary way is utilized to make light; while all the rest is wasted, so far as the eye is concerned. Hence, if such a lamp is supplied with 60 watts, and gives a light of 16-candle power, only 3 watts are really transformed into light; so that the mechanical value of the light so produced is rather less than a quarter of a watt per candle. This luminous efficiency varies with the temperature of the filament. At a low red heat, it is not more than 1 per cent.; but it increases to about 5, 6, or 7 per cent. at the normal working temperature. Thus, for an Edison 16-candle power lamp, Mr. Merritt has determined the following values, when the lamp was worked at various pressures, so as to give different quantities of light:—

Luminous Efficiency of a 16-Candle Power Edison Glow Lamp.

Working Volts.	Candle Power.	Power absorbed in Watts.	Watts per Candle Power.	Luminous Radiation in Watts.	Luminous Efficiency as a Percentage.
74·2	0·9	34·6	38·0	0·18	0·5 per cent.
91·6	4·8	56·2	12·0	0·68	1·2 ,,
97·3	7·3	64·6	9·0	1·13	1·7 ,,
100·3	8·9	69·3	7·8	1·62	2·3 ,,
107·6	14·6	81·6	5·6	2·97	3·6 ,,
109·3	16·3	84·4	5·2	4·57	5·4 ,,
124·1	38·2	115·4	3·0	7·46	6·5 ,,

With regard to the deterioration of incandescent electric lamps in use, Dr. Fleming observes that the changes that go on in the lamp are somewhat as follows: During the life of the lamp there is a progressive rise in resistance, a progressive diminution in candle power, and a progressive increase in watts per candle power. The value of a lamp to the user is not to be measured merely by the watts per candle power it takes at the commencement of its life; but also, to a large degree, by the extent to which this consumption of energy and production of light remain constant during the life of the lamp. This is best expressed by the percentage of the variation of the candle power during the life of the lamp, when taken at equal intervals of time. Thus, a 16-candle power lamp, taking, say, 60 watts at the commencement of its life, but which after two or three hundred hours in use is giving no more than 8 candles light, though taking the same power, is costing the consumer twice as much per candle at the end of this period as it did at the beginning. It has therefore been suggested that, at the end of a certain period, when the candle power of a lamp has suffered a certain deterioration, the lamp should be "smashed," and a new one put in its place. This course, however, Dr. Fleming will by no means admit to be always desirable or necessary; for if the old lamp, although dimmer than at first, is giving enough light for the purpose for which it is required, then, although its illuminating power is diminished, if the energy taken by it is diminished also, the total cost to the consumer of the arrangement will on the whole be less than that of a new lamp. Dr. Fleming is of opinion that incandescent electric lamps are most economically worked at such a filament temperature as corresponds to an efficiency of from 3 to 3½ watts per candle power. Broadly speaking, the life of a lamp of this kind is dependent upon the electric pressure at which it is worked, and so is its illuminating power. The following tables give the candle power yielded by two particular lamps when worked at different pressures. A very cursory examination of these tables will show that the light given by the lamp varies enormously with the pressure; so that a very small diminution of pressure suffices to deprive the user of a very large proportion of the candle power for which the lamp is constructed.

Candle Power of Certain Nominal 8 and 16 Candle Power Incandescent Lamps, when worked at Various Pressures in Volts.

16-Candle Power Lamp.		8-Candle Power Lamp.	
Volts worked at	Yielded a Candle Power of	Volts worked at	Yielded a Candle Power of
105	22·3	102	7·90
100	16·7	100	6·90
95	12·2	98	6·10
90	8·7	96	5·35
85	5·9	94	4·70
80	4·0	92	4·20
75	2·5	90	3·65
70	1·5	88	3·20
65	0·8	86	2·80
60	0·6	84	2·35
		82	2·20
		80	1·70
		78	1·40
		76	1·15
		74	0·90

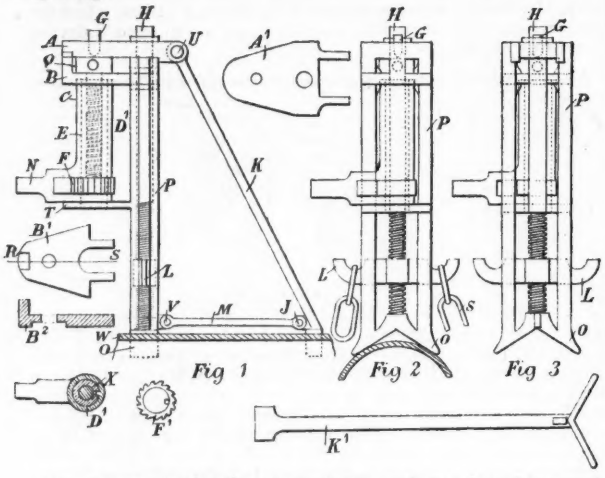
REGISTER OF PATENTS.

Heating Vehicles with Gas.—Hausenblas, J., of Augsburg, Germany. No. 9033; May 7, 1894.

This invention refers to the heating of railway carriages, &c., and consists of an automatic regulator heating arrangement, for use with high-pressure gas stored in reservoirs, and fitted with pressure-reducing regulators constructed so that a gas-stove having separate gas-feeds—one for heating and one for igniting purposes—has its heating-burners turned on and off by a heat-regulating device, for the purpose of obtaining and keeping up a certain degree of temperature for a length of time without attendance.

Drilling and Tapping Gas and Water Mains.—M'Nair, J., of Wishaw, Lanarkshire. No. 10,883; June 5, 1894.

This invention for expeditiously drilling and tapping water and gas mains, or other iron articles, is shown in detail in the accompanying engravings.



The apparatus is placed on the main W; and the chain S is passed under it and hooked on to the double hooked nut L, which is between the uprights P, so that the bolt H can be lowered or raised. So soon as the chain has been put into position, the bolt is screwed up, and the chain is thus tightened, so that the apparatus is so drawn upon the main that it is ready for commencing the operation of boring. The tapping device itself is composed of four upright standards P, with a base O, having a suitable angle to fix upon the main. The uprights are separated by collapsible stays K M; and these are fixed together with bolts J V U. The uprights support a bracket A (a plan of which is shown at A^1). The ratchet-brace is composed of the cylinder C, the handle N, and a ratchet-wheel F. The cylinder E, with a slot D^1 and a bolt with a screw, is shown at Q. B^1 is a plan of B, and B^2 is a section of B^1 cut through the line R S of B^1.

The main is bored or tapped by working the handle N; and as the boring proceeds, the bolt Q is tightened, so as to allow the cylinder E to pass down the cylinder C, and to tighten the bit in the main. After the main has been tapped, the apparatus is removed by unscrewing the bolt H and removing the bolt J. The device may be so constructed that, by removing the parts T and B, any ordinary ratchet can be fitted in, and applied to, the boring of mains. G is a small bolt, with tapered point, which passes through A to prevent Q from rubbing on the underside of A.

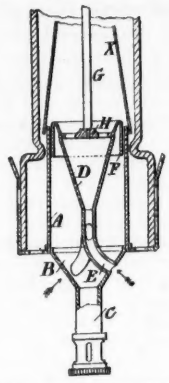
Water-Meters.—Burgess, H. E.; communicated from J. Margossof, of Cairo, Egypt. No. 11,171; June 8, 1894.

The principal claim for this invention is for the combination (in apparatus for measuring and indicating the consumption of water or other liquid), with a metering or registering device actuated by the variation in the level of the liquid, of an inlet-pipe, provided with a draw-off cock and means for closing the supply main when drawing off; also a "union," having at each end a valve-seating, and provided with a valve actuated by a float, so that, when the liquid is either at its lowest or at its highest level, the inlet is closed.

Incandescent Gas-Lights.—Horwitz, M., of Berlin. No. 11,278; June 11, 1894.

This invention relates to a burner employing an incandescent body, so arranged that, without the aid of any mechanical device, the flame which (with the present burners) converges, is made to diffuse in tubular form through nearly its whole length. This is effected by a strong current of air conveyed into the centre of the Bunsen flame, so as to spread the latter out in tubular form, and thus cause it to come in contact with the incandescent body in such manner that every part is made to glow.

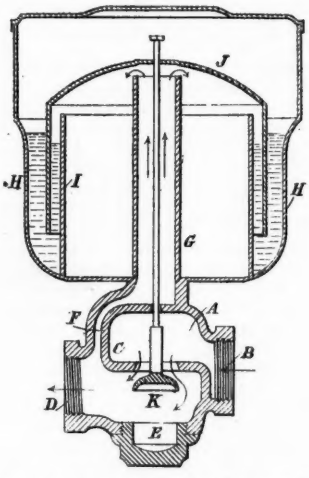
In the construction shown in the engraving, the burner consists of the casing A, to which the conical collar B is fixed. The gas-inlet pipe C is connected to the collar, and is provided with openings (as customary with Bunsen burners) through which air passes to produce the mixture of gas and air. In the casing, a tube or shell D—preferably conical—is provided, whose lower end communicates with one or more open pipes E, passing through the conical collar, and thus allowing pure air to enter. The object of this current of air is to effect a tubular-like spreading or diffusion of the flame. The upper end of the tube or shell is bent over, so as to form a flange F. The space between this flange and the casing A forms the outlet for the combustible mixture of gas and air, which is brought somewhat under tension owing to the conical form of the tube D; while the flange F catches the current of gas in such manner that no roaring of the flame can take place. The current of pure air through E, caused when the light is burning, passes out of the upper end of the shell D, and impinges



against the flame, which is consequently diffused in tubular form, also at its upper part; and the incandescent body X is thus acted upon by the flame at every part. This incandescent body, of the form of a truncated cone, and made of thin threads interlaced, is mounted on a pin or stem G, secured by a perforated disc H, through which perforations the pure air passes.

Gas-Governors.—Moore, S. H., Vernon, A. M., and Goodwin, H. J. of New York. No. 11,879; June 19, 1894.

This invention relates particularly to that class of governors in which a float actuated by the back-pressure of the gas regulates the movement of a controlling-valve, as shown in the accompanying illustration—a central vertical section of the governor.



The valve casing is composed of an integral metal casting, divided horizontally by a partition, so as to form an upper gas-chamber A, which has at one side a suitable inlet B communicating by an orifice C with the lower portion. This lower portion is provided at one side with an outlet D, used preferably to connect with the pipes leading to the burners; the valve-casing having also a bottom outlet E, which may be utilized as a drain or may be connected with the burner-pipe. On the exterior of the valve casing, and leading from a point above the outlet to a point centrally above the casing, is a channel F for gas. This channel connects at its lower end with the interior of the valve-casing below the partition; while, at its upper end, it joins a central tube G, which projects upward above the valve-casing into the tank or bowl H, adapted to contain the liquid seal. It has within it a central well I, formed by an annular partition, which projects upwards from the bottom of the bowl, and is concentric with the tube G. The bowl is partially filled with liquid—such as glycerine—so as to form a seal, through which the gas cannot pass; and in this seal is suspended a float J of cylindrical shape, but preferably round on top. It encircles the well I, but is of greater diameter, and has sufficient area to render it extremely sensitive to gas pressure; and thus it quickly operates the valve in connection with it. To the central portion of the top of the float is secured a valve stem, which extends downwards through the tube G and the top of the valve casing, terminating at its lower end in a valve K, which normally hangs below the passage C, but which, when raised, tightly closes it. The valve, being hollow on the under side, and convex on its upper side, fits snugly in the passage. The space between the well I and the float J is less than the space between the float and the sides of the bowl H; and this greater exterior area of the liquid seal contained in the bowl has a tendency to counterbalance any variation of the volume of the liquid within the float.

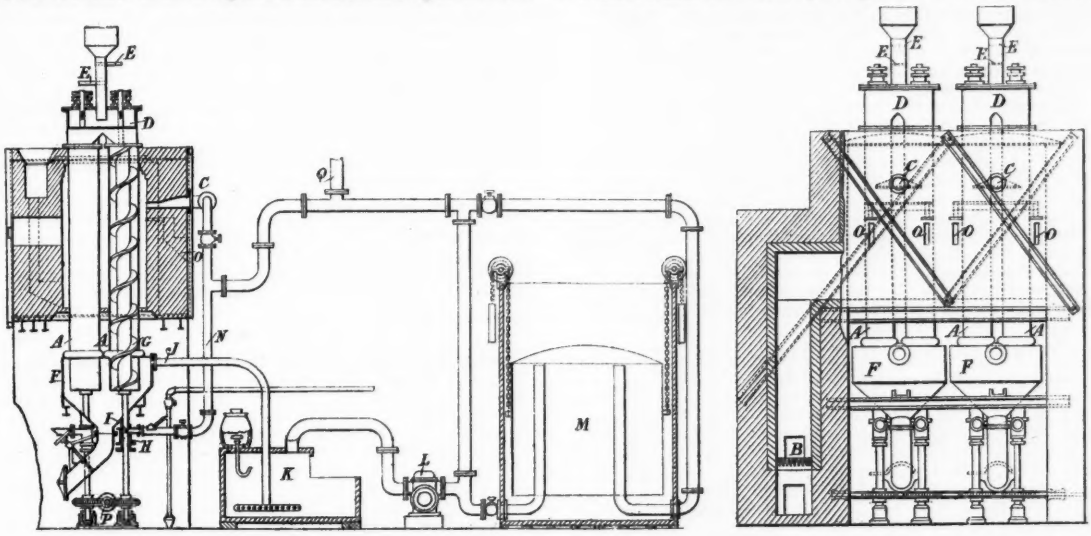
Gas, on entering, passes downward through the orifice C and out through D; while it also flows upward through F and G into the upper portion of the float. While the conditions are normal, the gas will flow through the valve-casing, and the valve K will be open; but when the pressure is greatly increased, the back-pressure through the channel F raises the float and partially closes K. If the pressure is then lessened, the valve drops again, and thus permits the gas to flow through the governor.

Obtaining Ammonia and Ammonia-Salts from Nitrogenous Organic Matters.—Lake, H. H.; communicated from L. Sternberg, of Jersey City, U.S.A. No. 12,881; July 3, 1894.

The object of this invention is to facilitate the carrying out of the process of obtaining ammonia and ammonia salts from nitrogenous organic matters described in patent No. 21,723 of 1892.

The furnace employed contains eight vertical retorts A, arranged in groups of four, and heated either by fire upon the grate B, or by the combustion of gas introduced through the inlet C. Each group of retorts has at the top a common feed-chamber D, into which is inserted a feed-pipe provided with two slide-valves E. This arrangement permits fresh charges of material being from time to time introduced, without allowing the outside air to come into contact with the glowing mass within the retorts. The lower ends of the retorts extend into the common receiving chamber F (closed at the top), communicating at the bottom with a discharge chamber, so arranged that material contained in it can be discharged without allowing outside air to have access to the interior. Each retort is provided with a vertical screw of cross-pitch, the thread G of which winds spirally around, and is affixed to an elongated drum mounted upon a hollow shaft, stepped at its lower end, and having an intermediate bearing in the hollow stuffing-box H. The portion of the hollow shaft contained within this stuffing-box is provided with a perforation I. Non-oxidizing gases mixed with steam are fed into H, and thence (through the perforation I) are discharged, near the upper end of the shaft, into a chamber at the upper end of the retort. The steam and non-oxidizing gases thus introduced are superheated within the shaft; and to some extent they cool the shaft, and preserve the screw from being destroyed by the heat within the retort. The gases and vapours issue from the lower ends of the retorts into the receiving chamber F, from the upper part of which they are led, by the pipe J, into an absorber K, of ordinary construction, wherein—by contact with sulphuric acid—the ammonia is absorbed and transformed into sulphate of ammonia.

The gases, freed from ammonia, are drawn from the upper part of the absorber by a pump L, and driven either into the gasholder M, or directly into the gas service-pipe, and to a system of distributing-pipes, one of which (N) is shown in fig. 2. Each distributing-pipe is provided near the top with a valve, by opening which the gas is allowed to flow into the inlet C, from which it is discharged into the furnace, wherein it is used to heat the retort by being burned with air introduced into



the furnace through the adjacent air-inlet O. At its lower end, the distributing-pipe N is provided with a valve connected with a pipe, by which it is conducted into the hollow stuffing-box H, as already mentioned.

In operation, the retorts are at first filled with the material to be treated—introduced through the feed-pipe, and falling through the retorts into the receiving chamber F, which it only partially fills, because the top of the receiving chamber is above the lower ends of the retorts. A fire is then started upon the grate B; and after the retorts have become heated and gas formed, it is introduced into the furnace chamber through the gas-inlet C, and there burned (as described) for the purpose of keeping up the heat. Rotatory motion is imparted to the vertical screws in the retorts from the worm-shaft P, which is adapted to engage worm-wheels affixed to the lower ends of the hollow shaft. By the rotation of these screws, the material contained within the retorts is kept from packing tightly, and is so loosened that the gases introduced into, and generated in, the retort can easily penetrate and make their way through the incandescent mass of material in the retort.

As the operation progresses, and occasion arises for the removal of material from the receiving chamber, a slide-valve is opened and the material allowed to fall into and fill the discharge chamber, after which the valve is closed, and the door of the discharge opened.

Gas-Engines.—Marks, G. C.; communicated from F. Hirsch, of Steinway, New York. No. 13,333; July 10, 1894.

The main objects of this invention are: (1) The avoidance of concussion and vibration, and the utilization of the power ordinarily wasted by such concussion; (2) the production of a more powerful engine for a given size and weight; (3) the simplification in the construction and arrangement of parts; (4) a perfectly balanced engine; (5) improved means for automatically governing its speed; and (6) improved means for supplying the engine with gas when a carburetter is used.

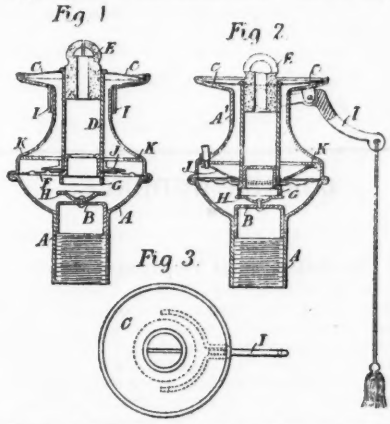
A distinguishing feature of the invention consists in the special construction of a gas-engine, having a duplex open-ended power cylinder, with a central gas and firing port. The two trunk pistons in the cylinder are pivotally connected by rods directly to the ends of two rocking levers, the opposite ends of which are connected by pitmans directly to radially opposed cranks upon a common power shaft. All the parts are arranged in a common central plane of action, coincident with that of the longitudinal axis of the power cylinder, so that the force of the explosion of gas between the two cylinders is counterbalanced and equally distributed and transmitted to the cranks on the power shaft. The engine can thus be made very compact as a whole; and it is especially adapted for use as a motor for boats, vehicles, &c., and for household purposes. Owing to the perfect balance obtained in and between the operative parts, it is said to be practically free from vibration, so that it may be employed without any special foundation.

Gas-Burners.—Reiset, F., of Katouah, U.S.A. No. 13,335; July 10, 1894.

This invention relates to a device which will maintain the valve of a gas-burner open so long as the gas is being consumed by ignition, but will automatically cut off the supply of gas when the flame has been extinguished and the gas ceases to burn.

Fig. 1 (below) is a vertical central section of such a burner, showing the position of the parts when the valve is raised and the pipe open. Fig. 2 is at right angles to fig. 1, and shows the valve lowered and the pipe closed. Fig. 3 is a plan.

A tight metallic casing A is provided near its lower end with a perforated partition or bridge B. The upper end of the casing is secured to the lower end of another casing A^1; and this upper casing has formed at, or secured upon, its upper end a concave flanged plate, within the turned-over edges of the flanges of which is an expansible metal plate C. This plate is preferably made slightly larger in diameter than the recess in the plate in which it is fitted; and it is thus of greater dimensions than the distance between the points where it is held. The plate C has a central opening, through which is passed the burner-tube D; and this has a flange on its upper end resting over C, so as to raise the burner and open the valve. An ordinary gas-tip E is held in the upper part of the burner-tube; and at its lower end a



flexible diaphragm F, having a central opening corresponding to the bore of the burner-tube, is secured to it at its inner edge, by means of a removable tubular valve G, which is screwed into the lower end of the burner-tube, and has a shoulder just below its threaded portion, between which shoulder and the lower end of the burner-tube the inner rim or edge of the diaphragm is clamped. The outer edge of the diaphragm is held between the flanges of the meeting edges of the casings A and A^1. The counterpart of the valve G is a valve-seat H, having a partly concaved upper surface and convexed lower surface. It is held upon the perforated partition or bridge B by a headed pin or stud, secured gas-tight to the valve-seat, or in one piece therewith, and extending loosely through a hole in the bridge, so as to have sufficient freedom of movement to seat itself tightly against the valve-seat when the burner is depressed, as in fig. 2, but held against upward movement by the head of the pin or stud, so as to resist the gas pressure,

and remain in position and permit the valve to be lifted from it in its opening movement. This valve-seat is self-adjusting, by reason of its curved under surface and its loose connection with the bridge. The concavity in the upper surface of H causes it to act as a basin to receive any dust entering through the opening of the burner-tip.

The upward movement of the burner-tube is brought about by hand; and to that end, a pivoted lever I is provided. It is bifurcated or forked, and has upwardly extending rounded projections at the end of its forks, arranged to extend through openings in the upper plate, and to bear against the lower surface of the expansible metal plate C. At the outer end of the lever, a cord or chain is secured. The downward movement of the burner-tube is effected by the reaction of a spring, which is compressed when the burner-tube is moved upward. This spring J is shown in figs. 1 and 2 as in the shape of a reversed arch; its outer ends bearing against an adjustable bearing-piece or ring K, and its middle portion upon the flexible diaphragm F at opposite sides of the burner-tube. This adjustment of the spring may be effected by the screw shown as extending through the casing and having a shoulder directly against the bearing-plate K, and a projecting stem which passes through slots in the plate and spring, and holds both in a lateral position.

When it is desired to ignite the burner, the gas supply is turned on; but as all the parts are then in the positions shown in fig. 2—with the valve-seat G closed tightly down upon the valve H—the gas cannot escape from the burner-tip until the cord is pulled down. This forces the expansible metal plate C to its upper position (shown in fig. 1); and thereby the burner-tube is lifted, and the valve opened to permit the free exit of the gas from the burner-tip. As soon as the gas has been ignited, the heat of the flame causes an expansion of the plate C; and this will cause it to curve further upwards, and be held so firmly in its upper position that, so long as the gas is ignited, the burner-tube will remain in its upper position and the valve in its open position. But should the flame go out from any cause—whether blown out or extinguished by a temporary stoppage of supply, or by the presence of air in the gas-pipe—the expansible plate C will cool, and it will quickly become sufficiently contracted to yield to the downward pressure of the spring J, so that the burner-tube will be moved downward by the spring, and the valve tightly closed, as in fig. 2.

APPLICATIONS FOR LETTERS PATENT.

16,281.—Orme, D., "Prepayment fluid-meters." Aug. 27.

16,295.—Bray, G., "Gas-burners." Aug. 27.

16,297.—Bray, G., "Reflecting gas-lights." Aug. 27.

16,342.—Ellis, G. B., "Production of metallic carbides and illuminating gas." A communication from T. L. Willson. Aug. 27.

16,395.—Browne, W. F., "Manufacture of gas." Aug. 27.

16,491.—Barker, T., "Gas and other lights." Aug. 30.

16,516.—Galley, J. G., "Meters for measuring water or other fluids." Aug. 30.

16,597.—Rosher, F. H., "Oil and gas heating apparatus for greenhouses, conservatories, halls, and the like." Aug. 31.

16,688.—Scherfenberg, R., "Petroleum and gas motor." Sept. 1.

16,695.—Bruck, S., "Electric lighting and extinguishing devices for gas-lamps." Sept. 1.

16,710.—Eliasson, L., "Electric lighting apparatus to be used in connection with gas-burners. Sept. 1.

16,742.—Webb, W. H., and Pleasance, E. S., "An attachment that may be fixed to any ordinary gas-bracket for the purpose of heating water, cooking food, &c." Sept. 3.

16,789.—Carter, W., "Improvements in the means of lighting billiard tables and the like." Sept. 4.

16,886.—Paskin, J. A., and Ackroyd, W., "The protection of lead in lead piping, &c., or vessels containing this or other poisonous metals, &c., against corrosion by water, &c." Sept. 5.

16,925.—Friedlander, H., "Improvements in incandescent gas lighting." A communication from C. M. Lungren. Sept. 5.

16,971.—Jobson, A., "Improvements in means for facilitating the loading of railway trucks with coke." Sept. 6.

17,083.—Carr, I., "Improvements in or connected with the manufacture of gas." Sept. 8.

17,135.—Duch, P. Casals y, "Improvements in and relating to water-meters." Sept. 8.

17,142.—Cowan, T. W. "Improvements in gas-lamps." Sept. 8.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Guarantee of Prepayment Meters.

Sir,—At the meeting of the Eastern Counties Gas Managers' Association held recently at Great Yarmouth—and at other similar meetings—much has been said upon the subject of the refusal of meter makers to guarantee prepayment meters for the same number of years as they have hitherto guaranteed the ordinary meters; and the opinion seemed generally to prevail that the gas companies had been badly treated in the matter. It will be conceded that there are two sides to this question; and as the case for the companies has been so freely ventilated in your columns perhaps, you will allow a review of the question from the meter makers' standpoint.

It is contended that the present five years' guarantee of ordinary meters is a concession granted to the companies as the result of competition among meter makers; and until the advent of the more complicated penny-in-the-slot mechanism, it was of trivial importance either to the gas company or the meter maker, by reason of the fact that failures in the mechanism happened comparatively seldom, and could be cheaply remedied. The absurdity of such a prolonged guarantee has, however, been long felt; and when the gas companies used it as a precedent for requiring a guarantee of a recently invented, and more or less complicated piece of mechanism, the makers very naturally refused to guarantee it beyond a period reasonably sufficient to prove its accuracy and reliability of workmanship.

It will be admitted that five years is a very long period in which to retain the liability of repairing, free of cost, a defect which may reveal itself in any machine; and in fact such a guarantee is almost unknown in the case of any machine other than a gas-meter. Then it is again contended that the case of the two meters are so entirely different that the gas companies have no claim to the prolonged guarantee of the coin-freed meter. The ordinary meter is usually placed in a protected situation, and is generally untouched for months together. The prepayment meter, on the other hand, must of necessity be placed in a situation conveniently accessible; and it must be manipulated almost daily—and this, too, generally by poor and ignorant people, who cannot be expected to regard with sufficient respect the delicacy of the mechanism. The prudent maker, therefore, assumes—and probably rightly—that the wear and tear upon the coin-freed meter will be considerably greater than upon the other; and he withholds the guarantee for any longer period than one year.

In cases where he is content to meet the gas company half way—by extending the guarantee, in consideration of an increased payment for the meter—it is contended by the companies that the maker has no claim to an increased charge, except upon the coin-freed mechanism. It is clear that the maker might, in the first instance, have so framed his charges as to protect himself from the consequences of a prolonged guarantee. But it is asserted that he has not done so; and his claim to do so at this stage is resisted as strongly as his withdrawal of the five years' guarantee. In fixing the increased charge, the makers were probably injudicious in basing it upon a percentage of the original price of the meter—thus giving rise to the companies' objection to pay except upon the price of the coin-freed mechanism only. Had they, on the other hand, consented to guarantee the meters for five years for a charge of 2s. or 2s. 6d., it is probable that this form of objection would not have arisen.

The gas companies, besides obtaining an increased number of consumers, sell their gas for cash, and at a higher rate than when they were giving three months' credit, as the result of using these prepayment meters; and it is submitted that an infinitesimal reduction in the quantity of gas supplied to the consumer for 1d. will amply recoup them for the increased charge of guaranteeing the meters.

Sept. 13, 1894. METERMAKER

Proposed Electric Lighting Installation for Middlesbrough.—A Committee of the Middlesbrough Town Council, consisting of the Mayor (Mr. Baker), and Aldermen Jones and Hinton, together with Mr. David Terrace, the Gas Engineer, and Mr. A. Sockett, the Deputy Town Clerk, have recently visited the electric lighting works at Newcastle, Leeds, Bradford, Halifax, Huddersfield, and Blackpool; and, as the result, they have furnished the following report to the Corporation: "(1) That the electric light is a paying business, and a profit is to be made by its adoption. (2) That the consumers in all places testified to the fact of its being superior to gas, and would on no account return to the latter. (3) That its sanitary effects are in the right direction, and admitted by all consumers. (4) That the consumers' goods are not injured as in the use of gas. (5) That the several systems acted well, though the Committee were exceptionally pleased with the installations at Blackpool, Huddersfield, and Leeds. (6) That having regard to the fact that a large sum of money will be immediately spent in the extension of our gas plant, and in the event of the electric light not being adopted that an additional sum will ere long be required for the purchase of further premises in Durham, East, and Bath streets, and probably elsewhere, and having further regard to the fact that the electric light is rapidly extending over the land, and that our neighbours are moving forward on these lines, and that it is not desirable that a private company should obtain powers for Middlesbrough to be approached hereafter for purchase (as in the case of Newcastle), the Sub-Committee are of opinion that it would be in the true interests of the borough to proceed forthwith with the laying down of an electric installation at a cost not exceeding £25,000."

Sales of Shares.—Last Wednesday, Mr. Alfred Richards sold by auction at the Mart the £6000 of perpetual 4 per cent. debenture stock in the *Tottenham and Edmonton Gas Company* which was recently advertised in the Journal. One of the large rooms was crowded to excess with intending investors; and the competition for the stock was exceedingly keen—the 90 lots into which the £6000 was divided being disposed of in less than half an hour. Prices ruled high—none of the stock going for less than £117 10s. per cent.; while the top price obtained was £119 5s. It will thus be seen that the hope expressed by the Chairman of the Company, at the recent meeting of the proprietors, that the stock would produce about these figures, has been fully realized; and altogether, judging from the prices that are paid for the same class of stock in many similar undertakings, the proprietors have reason to congratulate themselves on such a highly satisfactory sale.——Messrs. Crawter, of Cheshunt, Herts., sold by auction at Waltham Cross, on the 6th inst., a few shares in the *Harrow and Great Stanmore Gas Company*, and 250 £10 shares in the *Waltham Abbey and Cheshunt Gas Company*; the latter being the first portion of the additional capital authorized by the Company's Provisional Order of 1881. The following were the prices obtained: Two £20 shares (6 per cent. guaranteed) in the Great Stanmore Gas Company, realized £50 10s.; five £10 fully paid "B" shares in the Harrow and District Gas Company fetched £75; two fully paid £10 "C" shares in the same Company produced £22 15s.; and thirteen shares of the same class (with only £2 paid) changed hands at £30 17s. 6d. The Waltham Abbey shares were disposed of as follows: One lot of ten £10 shares at £110; seven lots, at £108 15s. each; and seven, at £107 10s. One lot of five shares, at £54 7s. 6d.; and nine lots, at £53 15s. each. One lot of three shares, at £32 12s. 6d.; and nine lots, at £32 5s. each. Three lots of two shares, at £22 5s. each; and two, at £22. Ten shares, offered singly, obtained from £10 15s. to £11 apiece.——Original £25 shares in the *Lewes Water Company* last week realized, at a local sale, £78 10s. each; new £25 shares (paying 7 per cent. dividend) fetched £52 and £53; a small parcel of the 1891 issue, ranking for dividend the same as the original shares (which pay 10 per cent.), was bought at a proportionate price; while £20 of 5 per cent. preference stock produced £30.

MISCELLANEOUS NEWS.

SHEFFIELD UNITED GAS COMPANY.

The Ordinary General Meeting of this Company was held last Tuesday—Sir F. T. MAPPIN, Bart., M.P., in the chair.

The GENERAL MANAGER (Mr. Hanbury Thomas) read the notice convening the meeting; and the Directors' report and accounts (which were summarized in the JOURNAL for Aug. 21) were then submitted.

The CHAIRMAN, in moving the adoption of the report and accounts, said the profit and loss account showed that for the past half year the net profit was £54,273. After paying the dividend which they that day proposed, amounting to £37,255, it would leave them £17,018 to carry to the reserve fund, which would then stand at £78,540. Such a result they could not at their last meeting have expected; but it was one with which they all—both shareholders and directors—were, he thought, well satisfied. They must congratulate each other on the change that had taken place since the autumn of last year. The result of the half year ending Dec. 31, 1893, appeared to be very disastrous—more so than they had experienced during any time since he had been Chairman. They had at that time to take £14,723 from the reserve fund, to enable them to pay their usual dividend; although during a considerable part of the time they had charged an increased price of 3d. per 1000 cubic feet. He could not help referring to the satisfactory settlement effected by Lord Rosebery between the miners and their employers in the autumn of last year. It was agreed that the men should receive the same rate of wages, with the 40 per cent. advance which they had obtained, until the end of January; and an arbitrator was appointed, who would be able to decide between the two parties if any difference arose. Happily, time effected much, and enabled both the miners and their employers to propose and accept terms which appeared to have satisfied most of them, and which would continue in force for two years from the date of settlement. The arriving at this arrangement, he (Sir F. Mappin) believed, was largely owing to the tact and judgment of the nobleman who had that difficult question placed in his hands. At the time the price of gas was advanced, the Directors promised, in a letter which they sent to the Town Clerk, that they would, as soon as ever circumstances would allow, reduce it again to what they had been charging. Immediately the balance-sheet for the past half year was made out, and the Directors felt themselves in a position to do so, they, without any hesitation, reduced the charges for gas to the lowest prices at which they had been able to supply it—viz., 1s. 10d., 2s., and 2s. 2d. per 1000 cubic feet, according to the quantity consumed. The capital expenditure, as the shareholders were aware, had been small, as the result, no doubt, of the advantage they found in having erected two gasholders at Grimesthorpe. The extensions there would not have to be pressed forward very rapidly. The quality of the gas had been maintained during the half year. They had made 974 tests, which showed they had supplied an illuminating power equal to 17·90 candles. The leakage had been 5·86 per cent., against 5·73 per cent. in 1893. He hoped they would be able to reduce this still more; but on that point he was not quite sanguine. The figures with reference to the meters they had fixed and withdrawn from use presented a somewhat remarkable feature. During the last twelve months, they had fixed 616 additional meters, which included every size the Company used—from 3-light to 500-light meters; but, on the other hand, they had been called upon to take back 620 2-light meters and two 50-light ones. So they had in use now six meters less than they had twelve months ago; but 620 of those taken back were of the smallest size. This, he thought, was evidence that the artizans in Sheffield felt the pressure of the times very considerably; and they had to economize by giving up their houses, and consequently the Company had had to remove that number of meters. He wished to refer to a feature in gas lighting which he thought was most satisfactory. The Incandescent Gas-Light Company had, in his opinion, put a weapon in the hands of the gas companies which would enable them to compete in a satisfactory manner with the electric light; for, with the incandescent gas-burner, they could supply as good a light as, and a much cheaper one than, that provided by electricity. The Welsbach incandescent gas-burner, using 2½ feet per hour, had many advantages. It would give them a light equal to 28 candles, emit less heat, was perfectly steady and very brilliant, gave off comparatively little carbonic acid, and, while consuming half the quantity of gas, gave three times the light of the ordinary flat-flame burner. It could be fitted to the existing gas-fittings, without trouble or inconvenience to the householder, and, in his opinion, rendered it extremely improbable that gas would be superseded by the electric light in the future. If an ordinary flat-flame burner, consuming 5 feet of gas per hour, was replaced by one of those using 3½ feet, there was no doubt they would get a light equal to 50 candles. The Company had fitted up a room to exhibit the burner to consumers; and his advice to all those who desired to have a most efficient burner was to go and see it. The Company who manufactured them had, during the last twelve months, greatly improved the light, and made the mantle a more permanent and efficient article. He proceeded to refer to the discussion on the subject at the last meeting of the North British Association of Gas Managers; and then, turning to the question of electric lighting, he pointed out that in London it had been decided that the Tower Bridge should be lighted with gas instead of electricity, and he thought the Engineers and the Bridge Committee were fully justified in declining the enormous expense of an electric installation. He did not think, after considerable experience, that they need fear the opposition of the electric light. They had had it so many years before them that they knew what it could do, and what it could not do; and, in his opinion, the electric light did not noticeably affect the increase in the consumption of gas in those towns where the public were fairly well satisfied with the gas supplied to them, and, from all he could ascertain, he regarded Sheffield as one of those towns. Passing the new Board Schools in Bow Street the other day, he saw a board notifying that the Electric Light Company were fixing apparatus to light the school. On going inside, he actually discovered that this expensive light was to be placed in the basement near the heating apparatus, as well as in the other parts of the school; and it struck him that this was not the way in which the ratepayers' money should be spent. Surely the extravagant building the Board had put up—faced ashlar stone for an infant school—should have been sufficient; but to give the children a luxurious light, which only the rich so far could afford, made him feel, quite independent of the question of gas or electricity, that care was wanting in the expenditure of the ratepayers' money. In conclusion, Sir Frederick referred to the fact that Mr. W. Wake, the Company's Law Clerk, would next month have been in their service 50 years. They owed him much for his timely and judicious advice; and his long life among them had been of very great assistance. A few years ago they recognized this by presenting his family with his portrait; and now he (the Chairman) could only express the wish that Mr. Wake might live many years longer in the enjoyment of good health.

Sir HENRY STEPHENSON seconded the motion, which was agreed to.

The CHAIRMAN then proposed, and Mr. H. HUTCHINSON seconded, that the maximum dividends be declared; and this was agreed to.

The retiring Directors—Messrs. J. W. Harrison, W. G. Blake, and R. A. Hadfield—were re-elected; and the proceedings then terminated with the usual recognition of the services of the Directors.

PROVINCIAL GAS AND WATER COMPANIES.

With the following paragraphs, we conclude, for the present half year, the notices under the above heading of the working of Gas and Water Companies in the provinces.

In submitting for adoption the report and accounts at the recent meeting of the Dover Gas Company (of which a summary has already been published), Mr. W. Mannering, the Chairman, referred to the result of the past half-year's operations as being all that could be desired, and said it added another link to the unbroken chain of prosperity which had for so long attended their efforts. Notwithstanding that gas had been sold at 6d. per 1000 cubic feet less than in the corresponding period of last year, whereby the consumers had saved above £2000, he had the gratifying announcement to make that the profits for the six months were sufficient to pay the parliamentary dividend, and leave the sum of £14 to be carried forward. Regarding the revenue, the receipts for gas were £1790 less; the difference would have been greater but for the increased consumption. The receipts for residuals were slightly more; but there was nothing to be said about them, excepting that they had fetched very good prices. With small increases in the meter and stove rental and the interest on investments, there was a total decrease in the revenue of £1742. On the other side, the outlay on coal was £750 less. They used 119 tons more coal; but it was obtained at 2s. 3d. per ton under the cost in the corresponding half year. The total reduction in the expenditure was £1067, from which it would be seen that the loss of revenue was met chiefly by cheaper coal, assisted by a reduced working expenditure—notably wear and tear—and an increased consumption of gas. There had been a satisfactory growth of business; the consumption of gas having been 2¼ per cent. over the corresponding period, which might be attributable to a considerable increase in the number of consumers and of gas-stoves. Taking the past twelve months, the number of consumers rose from 2301 to 2361; and the gas-stoves on hire, from 454 to 551. He might here say, that the purchase of a further supply of coal on terms nearly as favourable as last year, enabled the Directors to continue to supply gas at the present low rate of 2s. 6d. With reference to the manufacturing operations, very excellent results had been obtained. The quantity of coal carbonized in the half year was 7912 tons, which produced 87,914,000 cubic feet of gas, equal to 11,111 cubic feet per ton of coal, as against 11,174 feet in the corresponding period of 1893. The gas sold and accounted for was 82,831,500 cubic feet—equal to 10,469 cubic feet per ton of coal, as against 10,397 feet. The leakage or unaccounted-for gas was down to 5·79 per cent., as against 6·95 per cent. In conclusion, the Chairman acknowledged that for so prosperous a position of affairs, they were largely indebted to their able and energetic staff. The report was adopted; and a dividend was declared at the rate of 7½ per cent., less income-tax. The Chairman, in subsequently responding to a vote of thanks to him and his colleagues, stated that he believed that about sixteen years ago the Company were not sending out so much gas by 50 per cent. as they were at the present time; and, if he remembered rightly, the price then was 3s. 9d., as against 2s. 6d. now.

The Directors of the Filey Gas and Water Company have issued their annual report. They state that the receipts in both branches continue to increase; that the new water supply is all that can be desired; and that the consumption of gas, more especially for cooking and heating purposes, steadily increases. The balance in hand, including a small sum brought forward, is £1107. The Directors recommend a dividend of 7 per cent. on the original shares, and £4 18s. on the new shares; leaving a balance of £75 to be carried forward. Owing to the amount of gas unaccounted for, it is proposed to continue the laying of new mains.

As briefly stated in last week's issue, the half-yearly meeting of the Hastings and St. Leonards Gas Company was held on the preceding Thursday; and we are now in a position to give a longer account of the proceedings. Alderman Thorpe presided; and, in moving the adoption of the report, he said he thought that, without exception, the balance-sheet was almost the best that had been presented to the shareholders in his memory. They had an increase of 4½ million cubic feet of gas during the six months, producing £785 more. The sale of residuals during the six months had been very satisfactory. They had realized the large sum of £8183—an increase of £1105. Although extra coal had been used, the price had been lower; and they had spent £731 less on that item. It was pointed out in the last report that they would have to re-build No. 3 holder, which was almost useless and dangerous; and they had contracted for the work. The new one would have a capacity about three times that of the original; and owing to the very favourable time in regard to the cost of steel and iron, it would be built, from the designs of their Engineer

(Mr. C. E. Botley), on much improved principles, and would cost less than the old construction. It would cost from £7000 to £8000. Half of this was charged in the last six months; and the remainder would be paid out of the income of the current half year. They were obliged to pay for it out of revenue because it was a renewal. He thought the state of things was very satisfactory; and he had much pleasure in telling the shareholders that the Directors had resolved to reduce the price of gas 2d. per 1000 cubic feet at Christmas, which would be a benefit to the consumers amounting to £2800. There were at present 1200 cooking-stoves and 566 heating-stoves on hire. The motion having been seconded by Mr. Veness, Mr. Walder observed that he believed considerable savings might be made even now in the business. There was a large sum paid in cartage and trimming of coal. It had always been his idea that the coal could be conveyed into the works by an elevated railway, at a tremendous saving to the Company. Again, if they manufactured sulphate of ammonia themselves, there would be a still larger income from it. In reply to these remarks, Mr. Botley said the question of an elevated railway had not been lost sight of by any means; and it was just the very thing that he, as the Engineer, would desire. But they had to bear in mind their position in the valley, and the distance they were from the line. From various causes, it would be impossible to construct a railway to be of any service, except at enormous cost. It would entail a heavy viaduct; and the interest on the money would come to three or four times the sum they paid for cartage. Besides this, there was not room; and a railway would block up the yard. With regard to residuals, it had been previously stated that, when the existing contract ran out, they could take the manufacture of sulphate of ammonia into their own hands. At one time they had great difficulty in disposing of this residual. Then they made a mutual arrangement; and they were now making £1000 a year more than they were before. They were not, however, losing sight of the fact that they might produce more out of the ammoniacal liquor. In answer to a question, it was afterwards stated that the cost of cartage and trimming of coal from the railway to the yard was 9d. per ton. The report was adopted; and after some formal business had been disposed of, the Directors and officials were thanked for the attention they gave to the Company's interests.

The accounts of the West Kent Gas Company for the half year ending June 30 show a total income of £7002, of which sum the expenses absorbed £4348—leaving a profit of £2654 on the working. The balance of net profit to be carried to the next account, subject to the half-year's dividend, is £4000. At the meeting of the shareholders held on the 3rd inst., it was agreed to pay dividends at the rates per annum of 8 per cent. on the original shares and 7 per cent. on the new issue shares. The amount which will be disposed of in paying these is £2350; showing that the dividend has been more than earned in the half year. The Directors announce the death of Mr. Edward Sandell, one of the Auditors, and the appointment of Mr. Magnus Ohren to the vacancy.

CARLISLE CORPORATION GAS AND WATER SUPPLY.

Annual Report and Accounts.

The report of the Gas, Water, and Baths Committee of the Carlisle Corporation, with the statement of accounts for the year ending June 30 last, has been issued.

With regard to the gas undertaking, we learn that the bright weather of last year caused a decrease in the consumption of gas in the six months ending in December last—a circumstance which had not previously occurred. Since that date, however, there has been an increase at about the usual rate. The total quantity of gas made during the financial year was 232,790,000 cubic feet; showing an increase of 4,590,000 cubic feet over the previous year, or equal to 2·01 per cent. The gross profit for the year was £7124, as compared with £3763 in 1893. Whenever opportunity has occurred, the retort-settings have been replaced by new ones on the regenerative principle. These improvements have effected a considerable and permanent saving in the cost of manufacture. The works throughout have been maintained in an efficient condition. The revenue from the sale of water continues to increase, although the depression in trade has led to a diminished sale for manufacturing purposes. Some exceptional charges, chiefly for maintenance and repairs during the year, have had the effect of slightly reducing the profit in this department; the gross amount in 1894 being £4503, as compared with £4907 in 1893. The total gross profit from the gas and water works for the year was £11,627. The usual amount for repayments of loans and interest are payable out of the gross profit; and this it is anticipated will amount approximately to £3500 in the Gas Department, and to £2500 in the Water Department.

The Gas and Water Engineer (Mr. J. Hepworth, M.Inst.C.E.), in his report to the Committee, states that the expenditure on capital account during the past financial year was practically limited to the outlay on new mains, services, and meters. Considerable repairs were carried out in the distribution plant, the present satisfactory condition of which is shown by the smallness of the quantity of gas unaccounted for. The consumption of gas still increases; and the introduction of prepayment meters has resulted in an addition of 600, or 10 per cent., to the number of consumers. The following figures enable comparisons to be made between the past and the preceding year with respect to the manufacture and sale of gas.

	1893.		1894.
Coal and cannel carbonized	21,530 tons.	..	21,788 tons.
Gas made	228,200,000 c. ft.	..	232,790,000 c. ft.
Do. per ton of coal carbonized.	10,599 ,,	..	10,684 ,,
Gas accounted for . . .	224,355,300 ,,	..	229,586,100 ,,
Do. not accounted for . .	3,844,700 ,,	..	3,203,900 ,,
Percentage of unaccounted-for gas	1·64	..	1·38

The foregoing figures show that there was an increase of 258 tons of coal and cannel carbonized, of 4,590,000 cubic feet in the quantity of gas made (or 85 cubic feet per ton), of 5,230,800 cubic feet in the quantity accounted for, and a decrease of 640,800 cubic feet in the amount unaccounted for, or a drop of 0·26 per cent. The illuminating power of the gas averaged 19·18 sperm candles. The number of consumers at the end of the year was 7171, as compared with 6301 in 1892-3; and there were in use 642 gas cooking-stoves, 1297 gas-fires and heating-stoves, 395 boiling-stoves, and 52 gas-engines. Reporting upon the Water Department, Mr. Hepworth states that the total quantity of water pumped in the twelve months ending June 30 last was 375,082,450 gallons, as compared with 365,637,657 gallons in the year 1892-3—an increase of 9,444,793 gallons. The water supplied for domestic purposes was 275,059,450 gallons; for trade and other purposes, 100,023,000 gallons—the figures for 1892-3 being 261,886,657 gallons and 103,751,000 gallons. The average daily supply for all purposes in that year was 23·29 gallons per head of the population; whereas last year it was 23·89 gallons—an increase of 0·60 gallon.

The accounts accompanying the report show that in the Gas Department the receipts were £33,511, while the expenditure was £26,387; leaving £7124 to be carried to the profit and loss account, the balance of which on June 30 last was £6213, as compared with £3076 at the close of the previous financial year. In the Water Department the receipts were £7797; and the expenses, £3295—leaving £4502 to go to the profit and loss account, the balance of which was £6463.

Mr. Hepworth also presented working statements in regard to the Gas and Water Departments. The former showed that the capital expenditure on the works and plant amounted to £5 10s. 2d. per ton of coal carbonized, or 10s. 7d. per 1000 cubic feet of gas sold. The quantity of coke made was 10,908 tons, of which 7370 tons were sold at the net price of 10s. 9·3d. per ton, and 3537½ tons were used as fuel, or equal to 16·23 lbs. per 100 lbs. of coal carbonized. There were 297,280 gallons of tar produced—equal to 13·69 gallons per ton of coal; and it fetched, on an average, 0·67d. per gallon. Of sulphate of ammonia, 197 tons 11 cwt. 2 qrs. were made, or at the rate of 18·13 cwt. per 100 tons of coal carbonized; and it fetched £7 19s. 1d. per ton, compared with £5 17s. 10d. per ton in the year 1892-3. The net proceeds of the coke and other residuals came to 45·27 per cent. on the cost of coal. The total expenditure on coal and for working, less residuals, was equal to 1s. 9·21d. per 1000 cubic feet of gas sold, and to 18s. 4·32d. per ton of coal carbonized; the sale of gas, rental of meters, and rents producing at the rate of 2s. 4·05d. and 24s. 3·47d. respectively—showing a profit equal to 6·84d. per 1000 cubic feet of gas sold, and 5s. 11·15d. per ton of coal carbonized, as compared with 3·31d. and 2s. 10·12d. in the preceding year. The statement with reference to the Water Department shows that the average daily supply of water for domestic purposes in the period covered was 753,587 gallons; for other purposes, 274,035 gallons. The estimated population supplied being 43,000, the average daily supply was 17·52 and 6·37 gallons respectively per head.

The report and accounts were submitted to the Town Council at their meeting last Tuesday.

Alderman R. Foster, in moving their adoption, said it would be very gratifying to the members and also to the ratepayers to see such a large increase in the profits of the gas-works this year compared with the year before—they were, in fact, nearly double. The increase arose from various circumstances. There were the regenerator retort-settings laid down by the Manager, which, by being further extended this year, had enabled the Committee to make gas at a less cost than formerly; a smaller quantity of fuel being consumed. There had been an increase of 258 tons in the quantity of coal carbonized; but they had made an additional 4½ million cubic feet of gas. The cost of coal was £2012 less; the gas sold had realized £566 more; while the return for residuals showed an increase of £670. The gross profits of 1894 came to £7124, as against £3763 in 1893; and the difference in the figures was to be attributed mainly to the three items—the cost of coal, the gas sold, and the return for residuals. The Committee had entered into contracts for the supply of coal. It had slightly increased in price—viz., about 5 per cent.; but, on the other hand, the price of cannel was lower, and the returns for residuals were expected to be better. Altogether the Gas Committee were under the impression that the present year would be even better than the one just closed. It was twenty-three years since he became a member of the Gas Committee; and at the beginning of that period, the retorts only produced about one-third of the gas that the present ones did; and the figures before the members showed the great improvement which had taken place in the manufacture of gas. They owed a great deal to their Engineer for building the regenerator settings, and for the increase which had occurred in the profits. As to the water-works, there had been an increase in the returns, as compared with the year before, amounting to about £275; but there had been a great deal more money expended in repairs and mains, amounting to £408. The general establishment charges had also been augmented; and the increase, with a portion of the expense incurred with regard to the Mosedale scheme, gave £268; making a total, with the sum for repairs, of £668. Adding to this other small increased expenses, and deducting the £275 extra revenue, they had a decrease altogether of £404, as compared with the receipts in 1893.

Alderman Creighton, in seconding the motion, remarked that it was very pleasing to him to observe that the gas-works had returned to their normal state of prosperity. For the last two years, the Finance Committee had not made anything out of the Gas Committee, because they just about, roughly speaking, squared accounts. He thought, however, the citizens should bear in mind that during the last two years the price of gas in almost every town in England had been greatly enhanced; while in Carlisle the Gas Committee thought it was advisable to wait for the turn of the tide, and, as they were not really losing money, they considered it was not fair to ask the citizens to pay a higher price. Speaking of the money spent on repairs of mains and services, he said that it had been exceedingly well laid out, as they found that the quantity of gas unaccounted for had been reduced from 1·64 per cent. to 1·38 per cent.

The motion was adopted.

BRADFORD CORPORATION GAS AND ELECTRICITY ACCOUNTS.

At the Meeting of the Council of the County Borough of Bradford last Tuesday, Alderman W. Moulson, the Chairman of the Gas and Electricity Committee, in moving the adoption of their minutes, said he was glad to be able to inform the members that during the past half year there had been a net profit on the gas undertaking of nearly £6000, as compared with a loss of about £1100 in the corresponding period of 1893. During the past six months, 71,240 tons of coal and cannel, costing £41,657, had been carbonized, as compared with 72,951 tons, costing £46,440—showing a saving of £4783. Purification had cost £1391, or £222 more than in 1893; but this was reduced by £150 extra received for spent oxide. The carbonizing wages had been £9777, or £107 more than last year. The repairs to works had cost £962 more, on account of alterations at the Mill Street and Valley Road establishments. Repairs to retorts had cost £3199, or £365 less than in the June half of 1893; repairs to mains and services, £413 more; meter inspection, £121 less; cartage and yard labour, £165 more, on account of the increased cost of finding tips for ashes; new lamps, lighting, and repairing, £3418, or £87 more; and salaries of clerks, £768, or £11 less. The interest paid on loans had been £9318, or £101 more; and sinking fund, £4260, or £13 more. On the other side, the receipts for gas had been £67,778, or £636 less, owing no doubt to bad trade. Coke had realized £10,971, or £2221 more; tar, £3989, or £1088 more; oxide, £396, or £147 more; chemicals, £10,830, or £1713 more; and meters, £518, or £207 more. The stove department showed a net profit of £13, or £12 less than in the first half of 1893. Other items left a net profit for the past half year of £5927, as against a net loss of £1120 in the corresponding period of last year. The department was therefore £7047 better this half year than in the June half of 1893, and £3771 better than in 1892. The average cost of coal and cannel during the half year had been 11s. 3¼d., or 1s. 2¼d. less. The quantity of gas made had been 739,318,000 cubic feet, as against 748,943,000 feet; and 10,377 cubic feet of gas, or 105 cubic feet more than last year, had been made per ton of coal and cannel used. As to coke and breeze, 8·37 cwt. had been produced for sale per ton of coal carbonized, or ½ cwt. per ton more than last year. The yield of tar per ton had been 12·17 gallons, compared with 11·84 gallons in 1893; and of ammoniacal liquor, 32·36 gallons, or nearly 3 gallons per ton more. Of sulphate of ammonia 29·29 lbs. had been made per ton of coal, as against 26·7 lbs. last year. There were 7464 public lamps now in use in the borough, or an increase of 132. The lighting, cleaning, and repairing of these, including the gas, during the past twelve months—the whole constituting what the ratepayers might consider a "free gratis" item—had cost £21,313. With regard to the electricity supply, he had also a favourable report to make. The laying of the three-wire system had involved an extra expenditure of about £700 on account of salaries and wages; but notwithstanding this, there was a net profit of £336 on the half year, as compared with £625 in the corresponding period of 1893. The motion was adopted.

PROPOSED ELECTRIC LIGHTING SCHEME FOR HERTFORD.

Strong Opposition by the Ratepayers—The Scheme to Proceed.

The ratepayers of Hertford are considerably exercised over the proposal of the Town Council to carry out an electric lighting installation under their Provisional Order, which they must either soon act upon or lose. The ratepayers assembled in large numbers, on the 7th inst., in the Town Hall, and discussed the question at great length. The Chairman of the meeting was Mr. A. Hawkes, who very fairly placed the arguments both for and against the proposal before the ratepayers. His main point in favour of the Corporation carrying out the work was that, if they did not, and a company was formed for the purpose, the ratepayers would always be subject to the highest rates for the electric light that could be exacted from them; whereas, if an installation was in the hands of the Council, only a certain profit could be received, while all over that amount would be applied to the reduction of the rates or the cost of the light. On the other hand, the principal objection to the project was that it was only intended for part of the town; and in the event of it not being a financial success, the whole town would have to be saddled with a permanent debt, while only a certain portion would reap any benefit. A resolution was moved by Mr. Munnings—"That this meeting, having considered the proposed electric lighting scheme of the Town Council, is of opinion that it is not desirable for the Council to proceed with it." To his mind, the light was unnecessary. But if it was imperative that it should be introduced at once, he suggested that the Corporation should seek a Company who would take over their Order; so that those who wished for the light would be able to have and pay for it. The motion having been seconded, Mr. Scales asked the pertinent question whether those gentlemen who were so anxious to have the light in the prescribed area would bind themselves for three or four years to take the light, and abide by any loss there might be. The discussion was continued at great length by ratepayers both for and against the scheme. Among the former was Mr. Durrant, who stated that a report on the scheme had been prepared by Professor Forbes, who was of opinion that it was satisfactory, first, as to the method to be adopted; secondly, as to the probability of making a profit; and, thirdly, as to the power to be employed (Dowson gas). This gentleman also moved an amendment, expressing the confidence of the ratepayers in their elected representatives, and leaving the question of the introduction of the electric light in their hands. This was put to the meeting and lost; the original motion being carried by an overwhelming majority. Before the meeting dispersed, a number of ratepayers appended their signatures to a petition embodying the resolution for presentation to the Council.

The petition came before the Council at a special meeting last Friday week. At the commencement of the proceedings, the Mayor (Mr. A. Baker) announced that he had had some correspondence with the Board of Trade with reference to the Corporation Provisional Order, and that a letter had been received from that body saying they would refrain from revoking the Order on receiving an assurance from the Corporation that they intended to exercise their powers within a reasonable time. But if the Corporation refused to give effect to the Order, and an application was received from a Company, it would be for the Board of Trade to consider whether they should not revoke the Order. Dr. Shelly then proposed that the scheme be carried out as speedily as possible. He strongly urged the Council to adopt the motion, and said that additional applications for the light had been received since the last meeting, bringing up the total applications to 1400 lights. After the resolution had been seconded, Mr. Garratt moved an amendment to the effect that the report be referred back to the Lighting Committee for further consideration, as it was considered that the details as to the profit and loss were incomplete in several important items. This, however, was rejected; and on the original motion being put to the vote, nine members declared in favour of it, and nine against—the Mayor giving his casting vote in support of the resolution, which was thus carried. It should be mentioned that two of the votes recorded for the resolution were given by Bengeo councillors, who, we understand, are not affected by the borough rates.

THE EXTENSION OF THE SOWERBY BRIDGE GAS-WORKS.

At the last Meeting of the Sowerby Bridge Local Board, the Clerk by request, read a report touching upon the question of the extension of the gas-works, which had been prepared by the Gas Engineer (Mr J. Marsland), and which was submitted at a previous meeting. As we have not had the opportunity of publishing the report before, we now do so. Mr. Marsland said: "I wish to say to the Committee—and I am fully convinced that it will be realized—that when we get the larger mains laid, and the pressure at West-end and Ripponden restored to what it ought to be, the gas we send out will be very largely increased upon anything that has so far been recorded. So much so, that I should really not advise the Committee to go on telescoping the gasholders any further, whatever is contended about it, for you will spend £3700 and gain about 290,000 cubic feet storeage; and, by that time, the consumption will have increased so much that you will be compelled to erect the proposed large gasholder at once, and the new retort-house will also be required, for I may say that all the retorts in the present house will be at work this winter certain. I may say that the price of gas was 4s. 2d. per 1000 cubic feet in the district, and 5s. per 1000 cubic feet outside the district, from 1861 to 1880; and for the year ending March 25, 1881, the gas sold by meter was 42,141,500 feet, at 3s. 9d. and 4s. 7d. For the year ending March 25, 1894, the gas sold by meter was 80,266,900 feet, at 2s. 6d. and 3s. 4d., excepting for three months there was an advance of 3d., owing to the coal strike. Now, the difference in these prices is a reduction of 1s. 3d. per 1000 cubic feet; and this amounts upon the total consumption of gas by meter for the year ending March 25, 1894, to £5016 12s. 6d., which is so much conceded to the consumers during that period. I find that for the year 1881 the amount set aside on sinking fund was £1065 15s.; but for the year ending March 25, 1894, the amount set aside was £1762 4s. 10d., and besides this the lamps are now supplied gratuitously, which will be about £600 per annum. The capital owing in 1881 was £41,082 0s. 10½d. The capital owing in 1894 was £23,210 5s. 6½d. The gasholder storeage in 1881 was 340,000 cubic feet. The gasholder storeage in March, 1894, was 340,000 cubic feet." In a conversation which followed the reading of the document, some of the members denied that it was an exact copy of the report contained in Mr. Marsland's book; and it was agreed that the report should be copied from the latter, and printed as an addendum to the minutes of next month.

Electric Lighting Scheme for Birkenhead.—At the last meeting of the Birkenhead Town Council, Alderman Deakin moved that the plan prepared by Mr. J. N. Shoolbred in connection with the central electrical generating station, be, with certain alterations, approved; and that the Town Clerk be instructed to submit it to the Local Government Board for their approval in connection with the application for sanction to borrow £20,000 for electric lighting purposes. The report was adopted.

Contemplated Enlargement of the Electric Lighting Plant at Portsmouth.—The Electric Lighting Committee of the Portsmouth Town Council have received the sanction of their colleagues to the spending of a further £6000 in extending the electrical generating plant, and to their proposal to apply to the Local Government Board for permission to borrow £20,000 to cover any further extension that may be required. At the present time, the Committee are supplying 4140 16-candle power lamps, and 725 are waiting to be wired—making a total of 4865, which, according to Alderman Ellis, represent an income of nearly £5000 a year, in addition to which the street lighting is being increased by the Corporation.

The Gaslight and Coke Company Fined for Deficiency of Illuminating Power.—At Bow Street Police Court yesterday week, The Gaslight and Coke Company were summoned, at the instance of the London County Council, for supplying gas of less illuminating power than it ought to be under their Special Acts of Parliament. Mr. J. W. Godfrey, on behalf of the Council, explained that under these Acts the Company were bound to supply gas of 16-candle power, and were liable to a penalty of 40s. for the first half candle deficiency, and to one of £25 to £100 for the first full candle deficient. The gas was tested at Spring Gardens; and, on March 3, it was found to be only equal to 14·8 candles, and on April 19 to 15·2 candles. Under the Act, the question was referred to the Chief Gas Examiner, whose decision was final; and it was now only left for the Magistrate to fix the penalty. On behalf of the Company, it was pleaded that the gas left the works of good quality, and at four other testing-stations was found on the same days to be of high illuminating power. The Company were quite unable to explain how it was found to be deficient at Spring Gardens. Mr. Vaughan imposed a fine of £25 in the first case, and of 40s. in the second, with 25s. costs.

NEXT YEAR'S EXAMINATIONS IN "GAS MANUFACTURE."

Now that the winter months are approaching, it is natural to conclude that the thoughts of many of our younger readers especially will be turning to the studies needful to fit them for successfully appearing for examination next May in one or other of the long list of subjects provided by the City and Guilds of London Institute for the Advancement of Technical Education. To all such readers we tender the advice to get, without delay, a copy of the "programme" just issued, under the sanction of the Council, by Messrs. Whittaker and Co., of Paternoster Square, E.C. The price is only 1od. net; or with postage 1s. 2d.—for it is a thick paper-covered book of some 300 pages.

Besides a full explanation of the rules and regulations for the examinations and for the guidance of class teachers, the volume contains a vast amount of general interesting details to indicate the direction in which those intending to present themselves for examination next May should pursue their studies. The examinations in "Gas Manufacture" and "Coal Tar Products" will both be held on Wednesday, May 1, from 7 to 10 o'clock p.m. The questions in the first-named subject will be prepared by Mr. Alfred Colson; and those in the latter class, by Mr. Arthur G. Green. The syllabus in the "Gas Manufacture" section will, for the "Ordinary Grade" examination, include questions founded on such subjects as the following:—

1. The construction of a retort or oven best adapted for the destructive distillation of coal. 2. The setting of retorts and construction of retort-furnaces. 3. The effects of temperature in modifying the quantity and quality of the gas produced. 4. The description and arrangement of apparatus employed for the conveyance of the gas immediately upon its leaving the retorts. 5. The description of apparatus best adapted for cooling the gas. 6. The most suitable condition of the gas for effective purification. 7. A description of the various instruments used in gas-works for ascertaining and recording pressure and exhaust. 8. The laying of mains and service-pipes. 9. The construction of gas-meters. 10. The fixing of meters and the fitting up of premises for the supply of gas. 11. A description of the various kinds of gas-burners in general use. 12. The use of an exhauster. 13. The methods employed for controlling pressure at the works, so as to secure an adequate supply of gas at the various points of consumption, with a due regard for economical effect. 14. The simplest methods of ascertaining the purity and illuminating power of gas. 15. A description of the materials and methods employed for the purification of gas. 16. Influence of temperature and atmospheric pressure upon the volume of gas. 17. A description of the various tests employed for determining the values of ammoniacal liquor and spent oxide.

In the "Honours" examination, more difficult questions will be set in the above subjects; and, in addition, a knowledge will be required of—1. The characteristic properties of the various kinds of coal, and their value for gas-making purposes. 2. The effects of temperature upon the production of residuals. 3. The chemical composition of coal gas. 4. The chemistry of purification. 5. Gas analysis. 6. The development of illuminating power. 7. The practice of photometry. 8. Labour-saving appliances in the retort-house, and the working of retorts. 9. The construction of gasholders, purifiers, and other gas apparatus. 10. The working up of ammoniacal liquor. 11. The principles of combustion, and their application to the working of retort-furnaces. 12. Carburetted water gas. 13. The enrichment of coal gas by means of oil, &c.

The first part of the book under notice concludes with a list of the teachers known to the Institute as holding classes in which students may receive the necessary technical instruction in preparation for the several examinations; and the second part is devoted entirely to giving in full—with diagrams where needed—the questions set in the 1894 examinations, with the maximum number of marks allocated for the answering of each separate question. The questions set at this year's examination, by Mr. C. Hunt, were given in the JOURNAL for the 7th ult., p. 293; and the 300 marks in each grade were divided up among the ten questions as follows: 35, 35, 25, 30, 25, 30, 30, 30, 30, 30 in the Ordinary Grade; and 35, 30, 35, 30, 30, 30, 30, 25, 30, 25 in the "Honours Grade."

Reduction in Price.—The Directors of the Broadstairs Gas Company have given notice that, after the reading of the meters at the close of the current quarter, the price of gas will be reduced to 3s. 3d. per 1000 cubic feet.

Electric Lighting and Gas Affairs at Hanley.—The Mayor of Hanley (Alderman E. J. Hammersley) told his colleagues, at their last meeting, that the electrical energy supplied by the Corporation was being fast taken up; and he expected there would be a demand before long which would make it necessary for the General Purposes Committee to apply to the Council for further powers. Regarding the recent reduction in price by the British Gaslight Company, he said it was satisfactory to know that the charge had been brought down from 3s. 6d. (the figure at which it stood when they started the agitation) to 2s. 6d. He had been making a calculation, which showed that from 1888 to 1893 the sums contributed from private rentals inclusive amounted to £152,962, and about an average of £3000 a year from public lighting under contracts. Up to the time of the reduction, the Company's statutory dividends had not been paid, or scarcely paid; and no amount had been placed to the credit of the reserve fund. From that time the statutory dividends had been paid; and the reserve fund had grown to £9316. Further, in the six years the public had paid £23,860 less than they would have done under the price of 3s. 6d.; £6050 being about the total of the reduction last year, when the charge was reduced from 3s. to 2s. 9d. By a reduction from 3s. down to 2s. 6d., about £5000 per year would be saved to the consumers, £4900 of which would directly affect their pockets. The agitation had, as before stated, saved £23,860 to the consumers during the six years—the whole cost of their electric lighting works. The results, he thought, had thoroughly justified the Council in the action they had undertaken.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The gas and electric lighting accounts of the Glasgow Corporation, having been approved by the Town Council, have now reached me; and I cull the following from them. The capital account stands at £1,183,535; having been increased during the year by £48,337. Of this, £31,987 was expended upon the additions to the Dawsholm station; the same station in the preceding year having had £53,324 expended upon it. There has been expended upon works, in all, £1,155,360. A noticeable feature of the accounts is that mortgages at 4 per cent., which in 1874-75 stood at £650,999, have, since 1885-86, been replaced by Corporation loans at 3½ per cent.; and there is now only £100 of mortgages remaining. Loans to the amount of £213,435 have been redeemed out of the sinking fund. The gross revenue, with gas at 2s. 6d. per 1000 cubic feet, amounted last year to £569,546, as compared with £594,049 in the preceding year, when the price of gas was 2s. 9d. per 1000 cubic feet, and which was the highest revenue ever earned in any year by the department. The gross expenditure last year was £455,928, as compared with £464,449 in the preceding year. Last year there was a gross profit of £113,617, as against £129,600. Out of the gross profit, a sum of £42,304 was written off for depreciation, which is at about the rate of 27 years' purchase; and the sum carried to profit and loss account was £71,313. Out of this, £61,617 was required for annuities and interest; £5550 was transferred to the sinking fund; and the balance of £4145 was left. This balance, with a surplus of £126 from the preceding year, was disposed of by meeting the loss of £607 upon the electric lighting undertaking, transferring £3500 to the fire insurance fund, and carrying forward £164. During the year, 463,887 tons of coal, costing £227,090, were carbonized, as compared with 465,590 tons, costing £257,692, in the preceding year; the difference being 1703 tons less in quantity, and £30,602 less in price last year. The gas sold last year amounted to 3,761,680,000 cubic feet, as against 3,819,039,000 cubic feet—a decrease last year of 57,359,000 cubic feet, or 1·5 per cent. This, with cheaper gas, is difficult to account for, except that it is caused by the exceptionally fine weather of 1893, and the absence of fogs during the winter. The revenue from gas amounted to £461,145, as compared with £515,741; from coke to £38,514, as against £30,227; and from ammoniacal liquor and tar, to £65,084, as against £43,792. Unaccounted-for gas amounted to 11·97 per cent., as compared with 10·82 per cent. in the preceding year; the increase doubtless arising from the great disturbance to mains and pipes by the extensive underground railway operations which are going on. The number of meters in use at May 31 was 162,074, an increase of 3175 during the year; the number of gas-stoves on hire was 10,999, an increase of 218; and the number of gas-stoves sold during the year was 1593, a decrease of 78 as compared with the preceding year. The price of gas has been continued at 2s. 6d. per 1000 cubic feet.

In the electric lighting department, the amount expended upon capital account is £116,585. The number of units generated was 854,766; sold to private consumers, 543,178; used in public lamps, 159,070; and used on works, 13,326—leaving unaccounted for 139,192 units, or 16 per cent. There are 102 public lamps. The gross revenue was £18,015; and the gross expenditure, £9591. There was written off for depreciation, £4393; and of the balance of £4030, there was required £3438 to meet interest on loans and £1200 to the sinking fund, showing a deficit of £607. The preceding year it was £1773.

Mr. Andrew Terrace, the Manager of the Bonnyrigg and Lasswade Gas-Works, who spoke so sensibly upon the working of a Peebles oil-gas plant at the last meeting of the North British Association of Gas Managers, has been appointed Manager of the Blairgowrie Gas-Works, in succession to Mr. Forbes Waddell, who, as stated last week, has been appointed Manager of the Forfar Corporation Gas-Works. Mr. Waddell takes up his duties at Forfar the beginning of next week; and Mr. Terrace is expected at Blairgowrie in about a fortnight.

The 60th annual meeting of the St. Andrews Gas Company was held on Wednesday, when it was reported that the affairs of the Company continued to be in a prosperous and satisfactory condition. A reduction in the price of gas would have been intimated; but on account of the unsettled state of the coal market, the Directors felt it would not be judicious to do so in the meantime. A well-deserved tribute of praise for the admirable management of the Company, was paid to the Messrs. Hall. The usual dividend of £2 10s. per share was declared. Mr. Jesse Hall has been Manager of the Company for the long period of 44 years.

Among the valuation appeals which were heard in Scotland this week, there were two relating to the valuation of gas-works. Before the Mid-Lothian Valuation Committee, the Penicuik Gas Company sought to reduce the valuation of their works from £555 to £500. Counsel for the Company submitted that the principle laid down by Lords Trayner and Wellwood in the Kinross and Milnathort Gas Company's case—the amount of revenue over working expenses, under deduction of 20 per cent. as tenant's profits—should be followed. From the profits of £670 earned during the year, there should be deducted £52 for bad debts; 20 per cent. on £620 for tenant's profits, £124; and interest on floating capital of £1000 at 4½ per cent., £45. This would leave £461 as the fair value for the year; but, not wishing to be unreasonable, they were willing that the valuation should be fixed at £500. The Assessor said he had followed the Kinross and Milnathort case. He took the revenue at £2483; and from it he deducted meter-rents £25, expenditure £1732, interest on floating debt of £700 at 4½ per cent. £31 10s., and 20 per cent. for tenant's profits £138—leaving £555 as the assessable rental. The Assessor's valuation was sustained. The question was thus one of figures, and did not raise any principle. The other case was by the Brechin Gaslight Company, who asked that the valuation of their works should be reduced from £700 to £525. This was also a question of figures; and the Town Council reduced the valuation to £550.

An accident of a peculiar nature occurred on Monday to one of the workmen employed in connection with the construction of the new gasholder at Aberdeen. The man had been told by the foreman that

he must not continue working, but must leave the place. He declined to go the way the foreman indicated, and took hold of a rope which was hanging over a beam, in the belief, it is thought, that the rope was secured. It was not, and he fell a distance of 42 feet to the bottom of the tank. He was very seriously injured.

The strike of coal miners has all but collapsed, having lasted twelve weeks. This week an attempt was made to effect a compromise; but the masters insisted, as a condition of settlement, that the men should return to work at the wages which were being paid when the strike first began—Boards of Conciliation to be formed afterwards. The compromise fell through; the men in conference having resolved not to accept anything less than what they call Federation terms, which is the restoration of 6d. per day. Notwithstanding the resolution of the conference, large numbers of the men are breaking away. To-day there have been hundreds at work, and many more are to start next week. There will be no formal ending, so far as appearances go; the men in the districts going back of their own accord. In Fifeshire and the Lothians, they are resolved to stay out until a meeting of the Federation, which is to be held in Edinburgh on the 27th inst., is passed; but long before then they will be all at work. The loss to both masters and men, and to many others who are dependent upon coal for the carrying on of their industries, has been enormous; and the men have gained nothing by their struggle.

Broughty Ferry is threatened with invasion by the Northern Electric Supply Company, who hail from Aberdeen. Notice has been given by the Company that they intend to apply for a Provisional Order for the burgh; and naturally the Police Commissioners are very greatly concerned about it. Broughty Ferry is a suburb of Dundee which, if everything in this world were properly adjusted as between man and man, should be incorporated with the city. Before completion of the Tay Bridge, which opened up the Fife shore as a desirable residence for the merchant princes of the city, the Ferry was their popular resort. Even now many of them occupy most delightful villas on the slopes which look seawards; but since the bridge, which gives a dry-land connection with Fifeshire, was opened, the palmy days of the burgh have passed away. The place is, in fact, on the verge of languishing, if it is not altogether so. The Police Commission are in straits at times to carry on; so much so that the prevention of the deposition of offensive material on the sea-beach is a task almost too herculean for them. In these circumstances, it is not to be wondered at that the Commissioners look with dismay on the alternative which is placed before them of either allowing an alien company to come in and bleed them for 42 years, or of themselves incurring an outlay of £500 in obtaining a Provisional Order, and afterwards expending about £16,000 in setting up an installation. They are well persuaded that only a very few of the inhabitants—a few of the before-mentioned Dundee merchants—would use the light; and that therefore there would be but a small revenue from the undertaking. Their instinct, therefore, is not to oppose the Company's application. But then—and it is there that their difficulty comes in—42 years is a long time for which to give up the burgh to "foreigners;" and they are fain to keep them out. The Commissioners have lately held two meetings to consider the subject; and they have not been able to do anything—their last resolution being to wait for further information. Unfortunately, while they wait the Company may come in; and their waiting may cost them the independence they hold so dear. If my advice should reach them, I should say they ought to despatch their Town Clerk to Edinburgh, where, for a shilling or two, he could ascertain who are the shareholders of this Northern Electric Supply Company; the amount of the capital, nominal and subscribed; and the number of shares, issued and unissued. The same advice might be given to all burghs who are beset by these electric lighting companies—companies of mushroom growth and ephemeral nature, which have driven several corporations in Scotland into electric lighting ventures, not one of which, so far as I can recollect, with one exception, has ever done a stroke of work themselves. The exception is at Coatbridge, where the Caledonian Electric Supply Company—the Edinburgh Company who are bombarding Stirling—have an installation at work. I am convinced that, if the composition of these Companies were laid bare, their day would be over. In the Broughty Ferry Police Commission, on the 3rd inst., a proposal that no opposition should be offered to the Northern Company, provided they undertook to use gas for motive power and to take from the Corporation all the gas they required, was very nearly adopted, from what I would term the timidity of the members. Such a temporising policy is merely attending to details. Information all round is what the Commissioners require—information as to the applying Company, and also information, if they can get it, as to the probable demand for electricity in the burgh. The only question in that connection is whether they have not delayed too long in resolving to procure it. I may add that last week both the Inverness and the Motherwell Police Commissioners refused to give their consent to applications by marauding electric lighting companies—preferring to preserve their right to do themselves the work of introducing the light.

I am very pleased to see that the opinion I ventured to express a week or two ago, when treating of the resolution of the Board of Manufacturers not to open the National Gallery of Scotland during the evenings, on account of the deterioration of the pictures by gaslight, is supported by an artist of eminence. This gentleman, whose name I do not know, holds the opinion that the deterioration of pictures is due to the use of asphaltum in the composition of paints. One of the ingredients of asphaltum, he says, is volatile; and the pigment dries and shrinks. Modern artists are in the hands of the suppliers of paint, and cannot distinguish an adulterated or indifferent article from a good one. Just so. It is not gas lighting which ruins pictures, but the quality of the materials employed. Everyone knows how the Turner pictures have faded, on account of that great artist having used bad colours. I have myself seen paintings by Sir George Harvey, a former President of the Royal Scottish Academy, hanging in the hall of an educational institution, where gas would be used perhaps less than a dozen times in a year, hopelessly ruined by the cracking of the surface. Yet the Board of Manufacturers is supposed to contain the leading intellects of the North; and the members, who have at their command the best skilled advice procurable, run away with the stupid notion that gas lighting is the cause of the depreciation of the property under their charge. When such can be the case with gentlemen of their standing, what may be expected of less enlightened individuals?

Mr. James Wilson, C.E., Engineer to the Edinburgh and District Water Trust, has submitted a report to the Trustees upon the proposed addition to the water supply. He dismisses the Manor Valley scheme, on account of the difficulty getting sufficient foundation for embankments. Regarding the upper waters of the Tweed, he suggests the construction of a reservoir of 2¾ billion gallons capacity, from which a daily supply of 15 million gallons could be obtained, at an estimated cost of £646,000; and, when required, another reservoir could be constructed upon the Tweed itself, which would raise the daily supply to 24 million gallons. The St. Mary's Loch scheme he alters from what was suggested by the late Messrs. Leslie and Reid. Their proposal was to raise the level of the loch by the construction of an embankment about 400 yards down the valley from the outlet of the loch. It was, however, found that no foundation could be got there for the embankment at a depth of 100 feet. Mr. Wilson proposes to leave the loch at its present level, and to withdraw the water at a depth of 38 feet; this to be accomplished by means of a tunnel through solid rock into the loch about a mile above the outlet. The tunnel will be capable of carrying 45 million gallons of water per day, of which 18 million gallons will be sent into the stream of the Yarrow as compensation. The estimate for a first supply of 12 million gallons per day is £700,000; and a second supply of 12 million gallons would be got for about £186,000. The report is to be printed and circulated among the Trustees.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 15.

Sulphate of Ammonia.—There has been a good deal of quiet buying. Hence, even though there be but few parcels on the market, values do not reflect the improved demand; on the contrary, £13 5s. is now generally quoted. Makers themselves do not seem as sanguine at present as they were a short time ago; and they are evidently resigning themselves to the stern fact that the high figures ruling at this time last year are, at present at all events, a remote contingency. Simultaneously the "bear" element is coming into prominence once more; and, in a venturesome spirit, quotations are made even up to March next year at to-day's prices. Of course, the position is not improved thereby; and this action is more likely to retard the consumers' purchases. In spite of all this, the tone of the market is by no means as desponding as some would picture it.

LONDON, *Sept.* 15.

Tar Products.—Business is far from brisk in this market; and the better inquiry for benzol unfortunately comes from a source which may fail at any moment. Toluol is being used a little more freely; but whether this is going into colour making, or is being used to admix with solvent naphtha, remains to be seen. The heavier tar oils for lubricating purposes are moving off freely; but creosote and similar oils are difficult to sell, and are offering at low prices. Business during the week has been marked at the following rates: Tar, 14s. to 18s. Pitch, 32s. 6d. to 34s. Benzols, 90's, 1s. 1d.; 50's, 1s. 2d. Solvent naphtha, 1s. 3d. Toluol, 1s. 4½d. Creosote, liquid, 2d.; ordinary, 1½d. Salts, 16s. Carbolic acid, 1s. 7d. Cresylic acid, 1s.; crude, 10d. Anthracene, nominal, "A," 1s. 2d.; "B," 10d.

Sulphate of Ammonia.—The "bears" have enjoyed undisputed possession of this market for more than a week; and the price has fallen, in some instances, to £13 5s., while quotations vary between that sum and £13 10s., less 3½ per cent. A better feeling now pervades the market; and it is hoped that the rest of the month will see larger shipments and improved rates. Gas liquor is being held for 10s. to 11s. 6d. per ton.

Street Lighting by Incandescent Gas-Lamps.—It is understood that the Ipswich Gas Company are about to make an experiment with Welsbach incandescent gas-burners for outdoor illumination, by lighting Carr Street in that town with them.

The Gas Company's Affairs at Longford, Ireland.—On Monday last week, there was an arbitration inquiry into the affairs of the Longford (Ireland) Gas Company; and evidence was heard and accounts examined by the Arbitrators as to the cost of gas and the expenses of production. An elaborate award was prepared by the Arbitrators (Mr. C. B. Tully, of Sligo, for the Company, and Mr. T. J. Cotton, of Dublin, for the Town Commissioners) exhaustively dealing with the several matters brought before them.

The New Holder at the Sligo Gas-Works.—What is said to be the first three-lift gasholder on the wire-rope principle has just been completed at Sligo, under the direction of Mr. C. B. Tully, the Manager of the Gas Company. Last Wednesday, the holder was formally tested by the makers (Messrs. Ashmore, Benson, Pease, and Co., Limited, of Stockton-on-Tees), in the presence of the Directors of the Company and a number of visitors, when it is reported that "everything went off smoothly and without a hitch; the result being a most complete success."

Plymouth Corporation and the Gas Company.—One of the subjects which came before the Plymouth County Borough Council at their meeting yesterday week was a report by the Works Committee that the contract for street lighting will expire on Oct. 1, and a suggestion that application be made to the Plymouth Gas Company for a continuance of the supply. The Committee recommended that the Company be asked to supply gas to the public lamps for one year from the expiration of the contract, at a price not exceeding the lowest rate now charged to private consumers; whether they will reduce the sum now charged for lighting, extinguishing, and cleaning the lamps to 15s. per lamp per annum; and whether they "will repay the Corporation all monies paid within the last three years in respect of public lighting, over and above the cost of gas and the cost of lighting, extinguishing, cleaning, and repairing lamps and lamp pillars."

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—There is still very little movement towards any real improvement in the coal trade of this district. With the approach of the winter season, the better qualities are naturally meeting with rather more inquiry; but the increased weight of actual business is still only small, and supplies continue in excess of requirements, notwithstanding that very few pits are working more than four days per week. Common round coals, so far as local requirements are concerned, still hang upon the market; and engine classes of fuel continue more or less of a drug, with very low prices. With regard to quoted rates, these remain unchanged, except perhaps some weakening tendency in engine fuel, as the result of the break-up of the Lancashire Coal Sales Association; but there is still a good deal of very low selling all through. At the pit mouth, best Wigan Arley still averages 11s.; Pemberton four-feet and seconds Arley, 10s.; common house-fire coals, 8s.; and steam and forge coals, about 7s. to 7s. 6d. per ton. The common qualities of engine fuel can be bought at from 3s. 6d. to 4s.; good medium sorts, from about 4s. 6d. to 5s.; with some of the best qualities still quoted at 5s. 6d. to 6s. at the pit mouth. The probability of some early settlement of the Scotch miners' strike is inducing rather more caution on the part of buyers in placing out shipping orders for that district; but there is still a fairly active business doing, and although late rates are not quite so readily obtainable, steam coal is not quoted under 8s. 9d. to 9s., and engine fuel about 5s. 6d. per ton, delivered at the Garston Docks or the High Level, Liverpool.

Northern Coal Trade.—There is still a full demand for coal in the North of England. Shipments continue large; and they are expected to do for some weeks longer, by which time there should be a further enlargement of the consumption for normal and inland requirements. Best Northumbrian steam coals are steady at from 10s. 9d. to 11s. per ton f.o.b., for prompt delivery; but for forward delivery, from 3d. to 6d. less is quoted. Second-class steam coals are quieter, at about 1s. per ton below the price of best steam coals. Steam smalls are still firm at from 4s. 9d. to 5s. per ton. Gas coals are now meeting with a fuller natural demand; and with the sale of a few cargoes to Scotland, and a large general export, the production is now fully taken up. The declension that is expected in the Scotch demand, will be more than made up by the increasing consumption as the days shorten. There are many local contracts for gas coals in the market; and the expectation is that these will be allotted at something equal to current prices—from 7s. 3d. to 7s. 9d. per ton f.o.b. At the same time, it is evident that larger quantities of coal are being sent out on contracts; and thus the belief prevails that the London Gas Companies, and other large consumers, are increasing their stocks considerably. Household and manufacturing coals are dull, without much actual alteration either in the position or the prices; but there is a very fair demand for smithy coal, at good prices. In regard to coke, the market is irregular; shipments being limited, though local consumption is large. Best Durham coke is steady at from 13s. to 14s. per ton f.o.b. There is a little fuller production of gas coke; but the demand takes up the output very fairly. There is no actual alteration in gas coke this week.

Scotch Coal Trade.—On account of the indications that the strike of the miners is terminating, trade is in a mixed condition. Practically all the coal now on sale is English, a very large quantity of which is being carried by sea. The prices for it are showing a tendency to rise; but no contracts are being entered into except for immediate use. With the collapse of the strike, however, prices will soon go down. The contract for the Danish Government, which has for many years come to Scotland, has this year gone to the North of England. Other contracts have also been lost, the effect of which will be that, when the miners return to work, there will not be sufficient demand to keep them in full time, and prices may be expected to be easier during the winter. Those who have yet to contract for gas coal should not be in a hurry, as there is a likelihood of better terms being obtained after a while. Shipments are still improving. For the week they amounted to 9968 tons—an increase on the quantity in the preceding week of 1409 tons, but a decrease compared with the corresponding week of last year of 173,109 tons. For the year to date, the total shipments have been 3,768,339 tons—a decrease compared with the corresponding period of last year of 1,160,851 tons, and compared with the corresponding period in 1892, of 1,431,812 tons.

New Water-Works for Kilkenny.—From fourteen schemes which were submitted for a new water supply for the borough, the Kilkenny Corporation have selected the one propounded by Mr. J. F. Read, of London. The estimated cost of the works is £21,500.

Leakage at the Castleford Reservoir.—Considerable alarm has been occasioned at Castleford by the fact that, within the past few days, the whole of the water in the reservoir (estimated at between 15,000 and 20,000 tons) mysteriously disappeared. An investigation disclosed a crack at the bottom of the reservoir, through which the water had evidently rushed; and it had undoubtedly found its way into the old workings of the pits which abound under the site of the reservoir.

The "Bath-Rate" Agitation in South London.—Owing to the recent legal decision to the effect that the Vestry authorities have no right to expend public money in fighting the Lambeth Water Company, the Conference of South London Vestries and District Boards has been dissolved. Its members, however, have formed themselves into the Lambeth Bath-Tax Abolition Committee, which has for its object: "To obtain a final declaration of the law as to the right of the Lambeth Water Company to charge an unlimited amount for a bath in a private dwelling-house; and to obtain such an alteration of the law as will prevent water companies from cutting off the supply to a private dwelling-house for non-payment of water-rates, and confine them to the ordinary processes of law, which are found sufficient for the recovery of rent, rates, and taxes."

New Water-Works for Launceston.—It was announced at the meeting of the Launceston Town Council yesterday week, that the Local Government Board had sanctioned the borrowing of £10,000 for the carrying out of the new scheme of water supply for the town; the money to be repaid in 30 years. A few particulars as to the contemplated new works appeared in our issue for April 10 last.

An Electric Lighting Installation for Blackburn.—The Town Clerk of Blackburn has received a communication from the Local Government Board, sanctioning the borrowing of £32,000 for electric lighting purposes. They have also approved of the Corporation using No. 1 gas-works as a site for the installation; and the work, it is understood, will be proceeded with at once, with a view to an early completion.

Alterations at the Paignton Gas-Works.—The Directors of the Paignton Gas Company, having obtained their parliamentary powers, have at once directed their attention to the future management and enlargement of their gas-works. They recently appointed Mr. Thornton White, son of Mr. T. W. R. White, of Sherborne, as Manager; and, acting under the advice of their Consulting Engineers (Messrs. Willey and Co., of Exeter), they are now proceeding with extensive alterations of the works—including an entirely new purifier-house, additional retort-benches, and duplication of exhausting machinery. Messrs. Willey and Co. have recently completed a new gasholder, with cast-iron tank, a new scrubber, and condensers for the Company; so that the Paignton works will later on be entirely remodelled.

The Felixstowe Local Board and the Gas and Water Works.—At last Wednesday's meeting of the Felixstowe Local Board, a Committee appointed for the purpose of considering the question of the desirability of purchasing the Gas and Water Companies' property reported that they were unanimously of opinion that the water and gas supply of the district, especially the former, should be under the direct control of the Local Board; and they asked the members to resolve in favour of the principle of buying the undertakings. They further suggested that the Board go into Committee and arrange interviews with the Companies to endeavour to purchase their respective undertakings; and they also advised that an expert be engaged to assist the Board. A series of resolutions were passed agreeing with the several recommendations.

Plymouth Corporation Water Reservoir.—The Water Committee of the Plymouth Corporation presented a report at the meeting of the Council yesterday week with reference to the large storeage reservoir which is being constructed at Burrator, near the place on Dartmoor from which the water supply is derived. They recommended that the reservoir be constructed to the full height allowed by the local Act of 1893, under which the work is being carried on—the lower portion of the Sheepstor dam to be built of concrete and the upper portion of earth with puddle core. Mr. J. T. Bond, the Chairman of the Water Committee, in moving the adoption of this report, stated that the Act gave them power to build the Burrator dam to a maximum height of 77 feet, or a minimum height of 74 feet. Their policy in connection with the water undertaking was thorough; and the Committee unanimously recommended that the dam be built to the maximum height allowed by the Act. The additional 3 feet of height would give an increased impounding capacity of about 80 million gallons. It would be cheaper to do the work now than to add another 3 feet after the work was once finished; while the gradient of the road leading across the dam would be better at the higher than at the lower level. A dam of the maximum height would cost £2000 more than one of lower height. But the Committee had saved six or seven times that amount in the work already done; and it would not be necessary to go to the full length of their borrowing powers. In answer to questions, Mr. Bond mentioned that a saving had been effected in the cost of the pipes and the purchase of the land as compared with the estimates. The report was adopted. The Corporation, it may be added, are carrying out the work themselves instead of letting it to a contractor.

The Increase of the Salary of the Nottingham Corporation Gas Engineer.—Mr. Baggaley, one of the members of the Nottingham Town Council, at last week's meeting of that body, put a question to the Chairman of the Gas Committee (Alderman Barber) as to why the Gas Committee, within the last twelve months, had increased the salaries of two officials by £100 a year each, without conforming to the bye-laws of the Council, which said: "It shall be the duty of any Committee to report to the Council any increase they have made in the salary of an official, and at whose recommendation such increase has been made." He explained that he put the inquiry more for the maintenance of a principle than from any spirit of opposition. The reply given by Alderman Barber, furnished—apart from the question of principle—most conclusive proof that the increase was well deserved. The Council, he first pointed out, placed a number of gentlemen in responsible positions; they expected them to produce certain results, and, according to Mr. Baggaley, they tied their hands as to the way in which those results should be produced. When Mr. Chester was first appointed, it was at £100 a year less than his predecessor (Mr. Lewis T. Wright), but on the understanding that, if he gave satisfaction, the £100 should be added. During the last ten years, and since Mr. Chester had been there, the work of the department had gone up, as was shown by the increase in the amount of coal carbonized—from 125,000 tons in 1884 to 145,000 tons in 1894. The salaries for manufacture and management during the same period had dropped from £5411 to £4878—a diminution of £533 per annum. This meant that the Gas Committee were paying in salaries £500 less than in 1884, when the coal carbonized was less by 20,000 tons than now, and only £542 more than was paid in 1876, when the works were acquired by the Corporation, and the consumption of coal was little more than one-half what it was at present. There was no doubt it was quite right of the Council to keep a check, to a certain extent, on the advance of salaries; but where they had a gentleman in a responsible position, like the Engineer to the Gas Committee, and where so much depended upon the management of the concern, it would be very unwise to tie the hands of the Committee as to the salary they should pay. He believed the salary paid to Mr. Chester was not at all greater than he was fully entitled to.

Bristol Water-Works Company.—The Directors at their meeting on Saturday declared intermediate dividends for the half year to June 30 at the rate of £7 per cent. per annum on the ordinary shares, and at the rate of £4 18s. per cent. per annum on the seven per cent. maximum ordinary stock, payable on Oct. 15.

Redcar Water Supply.—The Cleveland Water Company have issued a writ against the Redcar Local Board, to obtain an injunction restraining them from proceeding to construct a new reservoir at Upleatham. Redcar obtains its water from a spring at Upleatham on the Marquis of Zetland's estate; and the Board had water-works there previous to the existence of the Company, but Redcar is included in the district of the latter.

The Public Lighting of Bodmin.—At the last meeting of the Bodmin Town Council, the Lighting Committee reported the result of the testing of the public lamps by meter. The total number of hours during which the lamps are burning is 155,498; and the consumption of gas, on an average, is 6½ cubic feet per hour—making a total consumption of 1,011,000 cubic feet. At the price of 3s. 7d., and with an allowance of £50 17s. 3d. for lighting, &c., the total cost was £232; whereas the last contract was £274. It was decided to send a copy of the report to the Gas Company, with a request that a conference might be arranged between the Directors and the Committee.

Improvements at the Wellington Water-Works.—The Wellington Town Commissioners have recently sought permission of the Local Government Board to borrow £1800 for water-works purposes; and Mr. W. J. B. Clarke has, on behalf of the latter body, held an inquiry into the matter. It was stated in the course of evidence that the Commissioners purchased the water-works in 1882, at a cost of £12,000; and the revenue last year amounted to £876. The £1800 was required to improve the water supply at the Limekiln reservoir. It also transpired that a sum of £450 had already been spent on a new reservoir, and that the work had been done without communicating with the Local Government Board, owing to pressing demands. There was a little opposition; one of the opponents being Mr. E. Lawrence, the Chairman of the Rural Sanitary Authority. He asserted that the applicants were not making as much out of the water-works as they might do, and that the position of the town was worse now than at the time the works were purchased. At the close of the inquiry, the Inspector visited the reservoir.

The Proposed Transfer of the Fareham Electric Light Works to the Local Board.—This matter was the subject of a public inquiry by Major Cardew, on behalf of the Board of Trade, at Fareham last Wednesday week. Among the witnesses was Captain Ramsey, who, speaking for the members of the Board who were in favour of the transfer, said that, since the Company was formed about four years ago, almost everybody had been extremely pleased at the manner in which the lighting had been done. It had worked smoothly and well. The Board therefore thought it would be a very good thing for them to acquire the Company's property, so that the illumination of the streets might be better carried on; and it was believed, far more private consumers would adopt the light. For the Company, Mr. J. Blake stated that the light had been supplied at such a low rate that they felt they could not go on longer at a loss or a very small profit. The Directors considered they would not be justified in investing another £1000, and so they offered the works to the Local Board. Respecting the objectors to the transfer, he declared that the principal ones were largely interested in gas. Evidence was afterwards given in support of the opposition. It was asserted that the Company were unable, without becoming bankrupt, to fulfil their unexpired street lighting contract, or the Board of Trade order to put the wires underground. The Local Board, it was urged, were not justified in forcing the purchase on the ratepayers; and the question should be postponed until the District Council were elected. The Company's accounts, it was stated, showed £813 10s. 9d. to the bad up to December, 1893.

The Filtration of the Wakefield Corporation Water Supply.—Professor Dewar, of the Royal Institution, London, has recently forwarded to the Wakefield Corporation a report on the question of the filtration of the water supply of the borough. He says that, in accordance with instructions received from the Corporation, he has conducted a series of experiments, conjointly with their Engineer (Mr. H. Rofe) on the use of a properly-constructed sand filter—identical in all its details as to distribution and proportions of filtering material with the plan of the projected filter-beds to be constructed at Wakefield—having regard to the special characteristics of the Wakefield supply of attacking lead and retaining a fine turbidity. He has, as the result, to report as follows: (1) The sand filter constructed by Mr. Rofe is effective in removing the action on lead, and also the fine turbidity when the rate of filtration does not exceed on the average 400 gallons per square yard of filter-bed per 24 hours. How long this preservative action on lead will continue, or whether the sand will lose in time its efficiency, can only be ascertained by actual experience of this particular sand. (2) If the use of carbonate of soda is continued, the sand filter will remove the finely suspended matter, assuming the rate of filtration is properly regulated; and in this case the water supply will retain its present character as to action on lead. (3) If sand filters are to be maintained in permanent efficiency both as regards the removal of the lead action and the fine turbidity (assuming the carbonate of soda to be discontinued), the experiments here show that the use of the sand ought to be combined with the addition of chalk in a fine state of division. Such addition of chalk will in no way materially affect the chemical composition of the supply. (4) In Professor Dewar's judgment, the character of the Wakefield supply demands efficient filtration; and as regards simplicity, effectiveness, and economy of working, he knows nothing better than the use of a sand filter. The City Council last Tuesday week approved of plans and specifications prepared by Mr. Rofe for the following work: The construction of four filter-beds at an estimated cost of £25,000; the erection of a pure-water tank at a cost of £665 18s.; the insertion of 18-inch pipes between the filter-beds and the service reservoir, £770; the construction of a service reservoir, £8900; land, £3200; and water-mains from the service reservoir into Wakefield to meet the complaints of poor pressure, £5290—making, with £3799 for contingencies, a total of £47,000.

Penny-in-the-Slot Stoves for Hotel Use.—It is reported that a penny-in-the-slot system for supplying gas-fires independently of the ordinary lighting arrangements, has been started at a hotel in Liverpool; and visitors can now have a fire in their bedrooms, at the cost of 1d. an hour, without troubling chambermaids or waiting indefinitely. Our informant writes: "The benefits of this system are incalculable, especially to travellers, whose lives are often endangered in damp bedrooms. Even in our own houses, we refrain from fires oftener than we should if they could be had by simply turning a handle at the outlay of 1d.; and no coal-fire would cost less than this sum per hour. It is to be hoped railway stations and hotels will adopt it without delay."

An Interruption in the Supply of Gas at Barnard Castle.—On the night of Saturday, the 8th inst., Barnard Castle was put to no small inconvenience through a sudden falling off in the pressure of the gas. The lower end of the town was thrown into a state of consternation; the gas supply being entirely absent, and business had to be carried on in the shops by the aid of candles. The streets, too, were in darkness save in the higher parts of the town; and but a faint glimmer was all that could be obtained. It appears that a gasholder was the cause of the unfortunate occurence. The holder has recently been enlarged by the addition of another lift; and this, it seems, suddenly refused to work. Assistance was obtained from the Whessoe Foundry Company, of Darlington; and matters were remedied so that a full supply was again obtainable on Sunday evening.

Failure of the Promoter of the British Water-Gas Company.—A statement of affairs was issued last week in the matter of the receiving order recently made, in the London Bankruptcy Court, against J. C. Cottam, late of 39, Lombard Street, E.C., described as a company promoter. It appears that, for some time past, the debtor has traded, in partnership, under the style of Cottam and Lambert; and, in this connection, a few years ago he promoted (among other joint-stock ventures) the British Water-Gas Syndicate—with disastrous effects to others besides himself. The partnership liabilities are estimated to exceed £150,000, of which no less than £100,000 is said to be due to the water-gas speculation. The private debts are returned at only £500; but there seem to be no available assets—the debtor's furniture being held under a bill of sale.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 552.)

Issue.	Share	When ex-Dividend.	Dividend & Div. Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	12 Apl.	10½	Alliance & Dublin 10 p. c.	10	18½—19½	..	5 7 8
100,000	10	,,	7½	Do. 7 p.c	10	13—14	..	5 7 2
300,000	100	2 July	5	Australian (Sydney) 5 % Deb.	100	105—107	..	4 13 4
100,000	20	14 June	8	Bahia, Limited	20	10—11	..	14 10 10
200,000	5	11 May	6½	Bombay, Limited	5	6—6½	..	5 0 0
40,000	5	,,	6½	Do. New	4	4½—5	..	5 4 0
380,000	Stck.	15 Aug.	11½	Brentford Consolidated	100	222—227	..	5 1 4
180,000	,,	,,	8½	Do. New	100	174—179	+2	4 15 0
220,000	Stck.	15 Mar.	11†	Brighton & Hove Original	100	210—215	..	5 2 4
888,500	Stck.	30 Aug.	5	Bristol	100	112—115	..	4 6 11
320,000	20	29 Mar.	11½	British	20	48½—49½	+½	4 10 10
50,000	10	30 Aug.	11½	Bromley, Ordinary 10 p. c.	10	21—22	..	5 4 7
51,510	10	,,	8½	Do. 7 p. c.	10	16—17	..	5 0 0
328,750	10	28 June	2	Buenos Ayres (New) Limited	10	6½ -7½	+½	2 13 4
200,000	100	2 July	6	Do. 6 p. c. Deb.	100	100—103	+1½	5 16 7
150,000	20	12 July	8	Cagliari, Limited	20	25¼—26¾	..	6 0 8
550,000	Stck	12 Apl.	13†	Commercial, Old Stock	100	267—272	+2	4 15 7
165,000	,,	,,	10†	Do. New do.	100	197—202	+2	4 19 0
160,762	,,	14 June	4½	Do. 4½ p c. Deb. do.	100	132—137	..	3 5 8
800,000	Stck	14 June	13	Continental Union Limited	100	239—244	..	5 6 7
200,000	,,	,,	10	Do. 7 p. c. Pref	100	210—215	..	4 13 0
535,000	Stck	30 Aug.	5	Crystal Palace Ord. 5 p.c. Stk	100	107—112	+2	4 9 3
486,090	10	27 July	11	European, Limited	10	22½—23½	..	4 13 7
354,060	10	,,	11	Do. Partly paid	7½	16—17	..	4 17 1
5,646,590	Stck.	15 Aug.	12	Gaslight & Coke, A, Ordinary	100	240—245	..	4 17 11
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	100—104	..	3 16 11
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	273—278	+2	3 12 0
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	130—135	..	3 14 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	200—205	..	3 13 2
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	179—184	..	3 16 1
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	271—276	+1	3 12 6
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	165—170	..	3 10 7
1,061,150	,,	14 June	4	Do. 4 p. c. Deb. Stk.	100	127—130	..	3 1 6
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	132—137	..	3 5 8
908,000	,,	,,	6	Do. 6 p. c. do	100	175—180	..	3 6 8
3,800,000	Stck.	11 May	12	Imperial Continental	100	228—233	+1	5 3 0
75,000	5	14 June	6	Malta & Mediterranean, Ltd.	5	4½—5¼	..	5 14 3
560,000	100	2 Apl.	5	Met. of Melbourne, 5 p. c. Deb.	100	111—113	+2	4 8 6
541,920	20	14 June	5	Monte Video, Limited	20	14½—15½	..	6 9 0
150,000	5	30 May	8	Oriental, Limited	5	6¾—7¼	..	5 10 4
60,000	5	13 Sept.	7	Ottoman, Limited	5	4—4⅛	+⅛	7 15 6
166,870	10	31 Jan.	2	Pará Limited	10	1¼—1⅜	..	11 8 6
420,000	100	2 May	6	People's Gas of Chicago— 1st Mtg. Bds.	100	102—107	..	5 12 1
500,000	100	1 June	6	2nd Do.	100	95—100	..	6 0 0
150,000	10	26 Apl.	6	San Paulo, Limited	10	8½—9½	—½	6 6 4
500,000	Stck.	30 Aug.	15½	South Metropolitan, A Stock	100	322—327	+2	4 14 9
1,350,000	,,	,,	12	Do. B do.	100	275—280	+2	4 5 8
260,000	,,	,,	13	Do. C do.	100	287—292	+3	4 9 0
750,000	,,	12 July	5	Do. 5 p. c. Deb. Stk.	100	156—161	..	3 2 2
60,000	Stck.	30 Aug.	11½	Tottenham & Edm'nton, "A"	100	215—220	..	5 4 7
				WATER COMPANIES.				
746,011	Stck.	28 June	10	Chelsea, Ordinary	100	285—290	..	3 9 0
1,720,252	Stck.	12 Apl.	8	East London, Ordinary	100	229—234	..	3 8 5
544,440	,,	28 June	4½	Do. 4½ p. c. Deb. Stk.	100	147—152	..	2 19 2
700,000	50	14 June	8½	Grand Junction	50	120—124	..	3 8 7
708,000	Stck.	15 Aug.	12	Kent	100	300—305	..	3 18 8
1,043,800	100	28 June	9½	Lambeth, 10 p. c. max.	100	262—267	+2	3 11 1
406,200	100	,,	7½	Do. 7½ p. c. max.	100	207—210	..	3 11 5
330,000	Stck.	29 Mar.	4	Do. 4 p. c. Deb. Stk.	100	132—135	..	2 19 3
500,000	100	15 Aug.	12½	New River, New Shares	100	382—387	..	3 2 8
1,000,000	Stck.	27 July	4	Do. 4 p. c. Deb. Stk	100	134—137	..	2 18 4
902,300	Stck.	14 June	6	S'thwk & V'xhall, 10 p. c. max.	100	168—173	..	3 9 4
126,500	100	,,	6	Do. D 7½ p. c. do.	100	149—152	..	3 19 0
1,155,066	Stck.	14 June	10	West Middlesex	100	273—278	..	3 12 0

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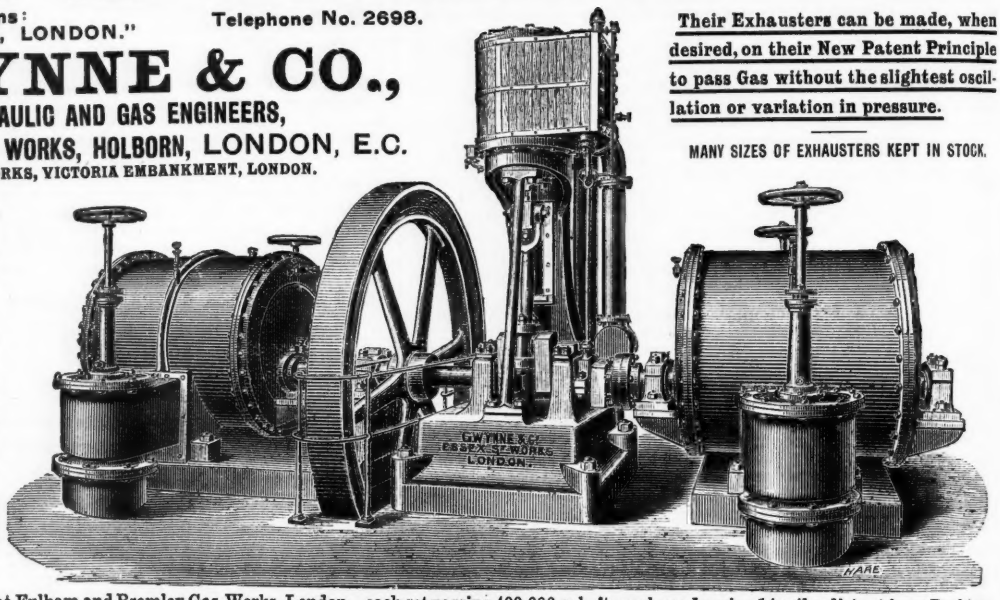

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STEADY Man (age 27) wants a regular Job—Boiler and Exhaust or Stoker—in Small Works. Good Character.
Address W. BUDD, 9, Dashwood Road, Battersea, LONDON, S.W.

WANTED, by a practical Man, a Situation as MANAGER or FOREMAN of a Gas-Works. A thorough knowledge of the manufacture of Gas and Sulphate of Ammonia on the most approved principles.
Address No. 2426, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a good steady Gas-Fitter for Compo. and Iron Pipes. Used to Service and Main Laying.
Apply, stating age and wages required, with recent Testimonials, to the GAS MANAGER, UTTOXETER.

WANTED, a Second-hand Letheby PHOTOMETER.
Apply, by letter, stating price, &c., to No. 2430, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Second-Hand Set of two 6 feet square PURIFIERS, with or without Centre-Valve; or one 8 feet square. In good condition.
Apply, by letter, to No. 2432, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS CARBON—4-ton Loads and upwards purchased by the BRIMINGTON CARBON COMPANY, Sowerby Bridge, YORKSHIRE.
State Price f.o.r. at nearest Station to Gas-Works.

FOR SALE—One 6-inch Station Governor with Bye-Pass Valves and Connections complete. In good condition.
Apply to HERBERT LEES, Gas-Works, HEXHAM.

TEN-HORSE Power "Trusty" Gas-ENGINE, by Weyman, FOR SALE. Cost £220 two years ago. Will be sold for half-price, to clear at once. Guaranteed in good working order.
Apply to W. BIRCH, HIGH WYCOMBE.

FOR SALE—A Gasholder, 16 feet diameter and about 10 feet deep, with Standards, Pulleys and Weights, &c. Duplicate PURIFIER, and two RETORTS, with Fire-Grates and Bars. A lot of Iron Piping, &c.
Apply E. GANDY, Land Agent, NORTHWICH.

FOR SALE.

SCRUBBER, 6 feet diameter, with Spiral Staircase, Gallery, House, Connections, &c., complete. Messrs. C. & W. Walker's best make.
GASHOLDER (with or without Wrought-Iron Tank), Single Lift, 100 feet diameter by 24 feet deep.
The above are being removed to make room for extensions.
For Particulars apply to No. 2431, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—A 12-Horse Power "Otto" GAS-ENGINE, with combined set of two Pumps 9 inches diameter by 10-inch Stroke, capable of lifting 12,000 gallons of Water per hour 200 feet high. The Pumps, Rams, and Valves are of Gun Metal, with Wrought-Iron Shaft. Fitted with Friction Clutch, for throwing in and out of gear, Pinion, Mortice Wheel, &c. The whole mounted on a solid Cast-Iron Foundation Plate. Removed to make room for a larger Plant.
Apply to the WATER-WORKS, ST. ALBANS.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

ALWAYS a Buyer of Spent Oxide, Tar, and AMMONIACAL LIQUOR.
Apply to J. HARDMAN, Milton, STAFFORDSHIRE.

THE Directors of the Dunfermline Gas-light Company, Limited, have the following PLANT for disposal, and are prepared to receive OFFERS for same:—
One TELESCOPIC GASHOLDER and GUIDES. Inner Lift, 63 ft. by 24 ft.; Outer Lift, 65 ft. by 24 ft.
One 20,000 Cubic Feet per Hour METER, by Jas. Milne and Son, with Bye-Pass and 8-inch Connections.
One STATION GOVERNOR, by J. and J. Braddock, 8-inch Connections.
One STATION GOVERNOR, by Jas. Milne and Son, 10-inch Connections.
Four PURIFIERS, 12 feet by 8 feet, with Six 12-inch Valves and Connections.
One TOWER SCRUBBER, 6 feet diameter, 20 feet high, 12-inch Connections.
One Walker's WASHING MACHINE, 12-inch Connections.
One Set of CONDENSERS, Ordinary Vertical Tubes, 18 feet high.
One Set of CONDENSERS, Ordinary Vertical Tubes, 12 feet high.
One Set of BATTERY CONDENSERS, 12-inch Connections.
Thirteen Sections of HYDRAULIC MAIN.
Thirteen Sets ASCENSION-PIPES and MOUTH-PIECES (Self-Sealing), for Five Retorts in a Setting.
One STEAM-ENGINE and Two PUMPS.
One BOILER, about 8 feet diameter by 20 feet long.
One BOILER (Egg-end), 6 feet diameter by 18 feet long.
One EXHAUSTER and ENGINE (combined), 12-inch Connections and Bye-Pass Governor.
One EXHAUSTER, 7-inch Connections.
One 2-Ton CART WEIGHING-MACHINE.
Inspection is invited; and the Plant may be seen any day between Nine a.m. and Five p.m.
HUBERT POOLEY, Assoc.M.Inst.C.E., Manager and Secretary.
Gas-Works, Dunfermline,
Sept. 12, 1894.

SULPHURIC ACID—Buyers: Aldershot Gas and Water Company. Quality: 80 per cent. Brimstone Acid. Quantity: About 60 to 80 tons during the ensuing Twelve Months. Delivery in truck lots, as ordered, to Tongham Station, L. & S.W. Railway.
Tenders are requested not later than the 30th inst., addressed S. A., Gas and Water Offices, 103, Victoria Road, ALDERSHOT.

TO TAR DISTILLERS.

THE Gas Committee of the Corporation of Blackpool are prepared to receive TENDERS for the surplus TAR produced (about 1500 tons) for the next Twelve Months, from Sept. 30.
Endorsed tenders to be sent to the Chairman by Saturday, the 22nd day of September.
(Signed) JOHN CREW, Engineer.
Gas Office, Blackpool,
Sept. 6, 1894.

DARWEN CORPORATION.

TO TAR DISTILLERS.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for all their surplus production of TAR from 13,000 tons of Coal to March 31, 1895.
Tenders, endorsed "Tar," to be sent to C. Costeker, Esq., Town Clerk, Darwen, on or before the 22nd inst.
THOS. DUXBURY, Manager.
Gas-Works, Darwen,
Sept. 8, 1894.

SALE OF GAS COKE AND BREEZE AT THE ROYAL ARSENAL, WOOLWICH.

THE Secretary of State for War is prepared to receive TENDERS for the purchase of such quantities of GAS COKE and BREEZE as may be for disposal during the period of One Year from the 1st of October, 1894, at the Royal Arsenal, Woolwich, where Forms of Tender and all Information may be obtained, on application to the Superintendent of Building Works.
Parties tendering will be at liberty to submit offers for either the Coke or the Breeze or for both, and are requested to make themselves acquainted with the mode of measurement at the Royal Gas Factory.
The tenders are to be delivered at the War Office, Pall Mall, S.W., by Twelve o'clock noon, on Wednesday, the 26th day of September, 1894, addressed to the Director of Army Contracts, and marked on the outside, "Tender for the Purchase of Coke and Breeze."
G. LAWSON, Director of Army Contracts.
War Office, Pall Mall, S.W.,
Sept. 13, 1894.

TO MANUFACTURING CHEMISTS.

THE Directors of the Rastrick Gas Company invite TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR produced at their Works during the ensuing Twelve Months from the 1st of October next.
Tenders, stating price per ton, and endorsed "Tender for Tar and Liquor," to be delivered at the Company's Office not later than Monday, Oct. 1.
The Directors do not bind themselves to accept the highest or any tender.
ALFRED WEST, Manager and Secretary.
Gas Office, Rastrick,
Sept. 11, 1894.

ISLE OF THANET GAS COMPANY.

TO RETORT & FIRE-BRICK MANUFACTURERS

THE Directors of the above Company are prepared to receive TENDERS for RETORTS, FIRE-BRICKS, and FIRE-CLAY required at their Works at Margate.
For Particulars as to Quantities, &c., apply to the undersigned.
Tenders, endorsed "Tender for Retorts, &c.," and addressed to the Chairman of the Company, to be delivered here not later than Thursday, the 27th inst.
By order,
H. H. JONES, Manager and Acting Secretary.
Gas-Works, Margate,
Sept. 15, 1894.

RAMSGATE CORPORATION.

(GAS DEPARTMENT.)

THE Committee invite Tenders for the supply of—
300 CAST-IRON SOCKET and SPIGOT PIPES, 12 ft. 4½ in. long and 12 in. diameter.
200 CAST-IRON SOCKET and SPIGOT PIPES, 9 in. diameter.
Together with sundry SPECIAL CASTINGS.
Tenders to be sent in not later than Sept. 29, 1894, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Pipes."
The Committee do not bind themselves to accept the lowest or any tender.
Full Particulars on application to
WILLIAM A. VALON, Engineer.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Romford Gas and Coke Company, Limited, are prepared to receive TENDERS for the surplus TAR produced at their Works for One, Two, or Three Years, commencing the 1st of October.
The Tar will be delivered into the Contractor's Tank-Vans, or Tank-Trucks on the Siding in connection with the Great Eastern Railway.
Offers to be at per Gallon.
Sealed tenders, endorsed "Tender for Tar," addressed to the Chairman, to be sent in not later than the 29th inst., by Twelve o'clock noon.
The Directors do not bind themselves to accept the highest or any tender.
By order,
HY. JOHNSON, Secretary.
Romford,
Sept. 15, 1894.

BINGHAM GASLIGHT AND COKE COMPANY, LIMITED.

THE Directors of the above Company invite TENDERS and DESIGNS for the erection of a new GASHOLDER and TANK of Wrought Iron. The Holder to be 34 feet in diameter and 12 feet deep, to be counterbalanced, and erected on a Concrete Foundation (which will be made by the Company).
The Holder and Tank to be erected and completed within Two Months from the date of the acceptance of the tender.
Plans, Specifications, and Particulars as to Site, &c., may be obtained from the Manager at the Works.
Detailed Specifications of Tenders and Designs to be sent to the Manager; and tenders, to be sealed and endorsed "Gasholder," to be sent to Mr. George Brown (the Chairman), Bingham, on or before the 29th day of September, 1894.
The Directors do not pledge themselves to accept the lowest or any tender.
By order,
HERBERT MORRIS, Secretary.
Bingham, Notts.,
Sept. 15, 1894.

MILLOM LOCAL BOARD.

TENDERS are invited for the supply of 1000 tons of GAS COAL at such times, and in such quantities, as the Board may require during Eight Months from the 1st of November next.
The Coal must be of best quality, and as free as possible from Bats, Pyrites, and Dross.
Full Particulars of the Coal and Colliery, and an epitome of the Working Analysis to be given.
The price per ton delivered free at Millom Station, and (where applicable) at the nearest or most available Port to the Colliery or Depôt, to be stated.
Sealed tenders, on Forms (which can be had on application to the undersigned) endorsed "Tender for Coal," to be sent to me not later than the 2nd of October next.
The Board will not be bound to accept the lowest or any tender.
W. T. LAWRENCE, Clerk to the Board.
Local Board Offices, Millom,
Sept. 14, 1894.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the Half-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 26th inst., at Half-Past Twelve o'clock precisely, to transact the usual Business, to declare a Dividend for the Half Year ended the 30th of June last, and to elect two Directors and one Auditor in the place of those who go out by rotation, but who are eligible to be re-elected.

Notice is Hereby also Given, that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 15th, and RE-OPENED on the 27th inst.

By order of the Court of Directors,
FREDERIC LANE LINGING,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.,
Sept. 5, 1894.

CRYSTAL PALACE DISTRICT GAS COMPANY.

SALE BY AUCTION OF £15,000 FIVE PER CENT. PERPETUAL DEBENTURE STOCK.

NOTICE is Hereby Given that the Directors have Instructed Mr. ALFRED RICHARDS to SELL BY AUCTION at the Mart, Tokenhouse Yard, E.C., on the 10th day of October next, £15,000 of FIVE PER CENT. PERPETUAL DEBENTURE STOCK OF THE COMPANY, pursuant to the Powers contained in the Crystal Palace District Gas Act, 1893 (56 and 57 Vic.), and the Resolution passed at a Meeting of Proprietors held on the 24th of August last.

Purchasers to make full payment before the 31st day of October, from which date Interest will accrue payable on the 15th day of January, and the 15th day of July in each Year, calculated to the expiration of the preceding Half Year.

Particulars and Conditions of Sale can be obtained at the OFFICES OF THE COMPANY, Lower Sydenham, LONDON, S.E.; of the Solicitors, Messrs. BLYTH, DUTTON, HARTLEY, AND BLYTH, 119, Gresham House, OLD BROAD STREET, E.C.; and of the AUCTIONEER, 816, High Road, TOTTENHAM, and 18, FINSBURY CIRCUS, E.C.

By order of the Board,
CHARLES M. OHREN,
Secretary.

Offices and Works, Lower Sydenham, S.E.

LIST OF APPLICATIONS will open on Monday, the 17th day of September, 1894, and close on or before Thursday, the 20th day of September, 1894, for Town and Country.

THE BLACKPOOL, ST. ANNE'S, AND LYTHAM TRAMWAYS COMPANY.

INCORPORATED BY SPECIAL ACT OF PARLIAMENT, 56 & 57 VIC., SESSION 1893.

The Liability of Shareholders is Limited to the Amount of their Shares.

Capital - - - £100,000
In 10,000 Ordinary Shares of £10 each.

Issue of 6250 Ordinary Shares, payable as follows:—

£0 10 0	on Application, producing	£3,125
1 10 0	„ Allotment „	9,375
2 0 0	„ 30th November, 1894	12,500
2 0 0	„ 31st January, 1895	12,500
2 0 0	„ 31st March, 1895	12,500
£8 0 0	Total Capital proposed to be called up	£50,000
2 0 0	Uncalled	12,500
£10 0 0		£62,500

Under Clause 10 of the Act, the greatest amount of a Call is fixed at £2 per Share, with an interval of two months between successive Calls.

DIRECTORS:
ABRAHAM PILLING, Esq., J.P., Grove House, Roe Lane, Southport *(Ex-Mayor of Southport)*, Chairman.
MALCOLM GUTHRIE, Esq., J.P., 76, Princes Road, Liverpool.
WILLIAM HAYNES, Esq., Laurel Bank, Eccles New Road, Manchester.
HENRY PERCY HOLT, Esq., Engineer, Gas Traction Company, 22, Chancery Lane, London, W.C.

BANKERS:
THE LANCASHIRE & YORKSHIRE BANK, LTD., Manchester, Halifax, Preston, Southport, Blackpool, St. Anne's-on-the-Sea, and Branches.

PARLIAMENTARY AGENTS:
Messrs. TAHOURDINS & HITCHCOCK, 20, Victoria Street, Westminster, London, S.W.

SOLICITORS:
Messrs. J. C. WALKER, DEAN, & CO., 37, King Street West, Manchester.

BROKERS:
Messrs. BECKER & EDWARDS, India Buildings, Cross Street, and Stock Exchange, Manchester.

ENGINEER:
CHARLES CHADWELL, Esq., C.E., Richmond Chambers, Blackburn.

AUDITORS:
Messrs. ALDRED, TURNER, & CO., Chartered Accountants, Manchester.

SECRETARY (*pro tem.*): E. H. TURNER.
TEMPORARY OFFICE:
8, Essex Street, King Street, Manchester.

PROSPECTUS.

THE Company has been incorporated for the purpose of constructing, working, and maintaining Tramways between Blackpool, St. Anne's-on-the-Sea, and Lytham, as authorized by the Blackpool, St. Anne's, and Lytham Tramways Act, 1893, which received the Royal Assent on the 24th August, 1893.

Route.—The line will commence on the Promenade at Blackpool, near the Manchester Hotel, at the junction of Lytham Road, and will proceed along Lytham Road to the South Shore Station of the Lancashire and Yorkshire Railway. Passing over the Railway Bridge, it reaches the boundary of the Borough of Blackpool at Squire's Gate Lane. It then enters the district of St. Anne's-on-the-Sea, turning down Squire's Gate Lane to the right for a short distance, when it enters Clifton Drive. On reaching St. Anne's, a short branch line will be made to the Railway Station. The line then continues along Clifton Drive to the boundary of Lytham, thence down Ansdell Road and Cambridge Road, passing the entrance to Lytham Hall and Lytham Church. Proceeding along Church Road, the line divides at the Market Hall, one branch going round by the Station and joining the other, both terminating in Clifton Square. The line is a very level one throughout, and will be easy to work.

A reference to the Key Plan [accompanying the Prospectus] will clearly define the intended route, which is about 8 miles in length, there being (including passing places) 11 miles of single line, of which 7 miles have to be laid by the Company.

The route traversed by the Tramways is identical with the well-known drive along the sea coast to Lytham *via* St. Anne's, which is the favourite drive in the district. The popularity of this route leaves no room for doubt that the facilities afforded by a Tramway along it will be productive of a large and remunerative traffic. But, in addition to this, it is anticipated that there will be a large local traffic at and between Blackpool, St. Anne's, and Lytham; and particularly over the portion of the route (upwards of two miles in length) from the Manchester Hotel in Blackpool along the Lytham Road to the Borough boundary, and also between Fairhaven and Lytham.

The great popularity of Blackpool, and its rapid development, are too well recognized to require further comment; whilst it is a well-known fact that St. Anne's-on-the-Sea and Lytham are annually becoming more largely patronized as favourite resorts of holiday seekers from all parts.

Of late years the land all along this route has been opened out, and promises to become highly popular as residential suburbs of the three towns respectively. Since Parliamentary Powers have been obtained to construct the Tramway, a great impetus has been given to the development of the district by the schemes now being actively carried out for founding the new sea-side resort "Fairhaven," between St. Anne's-on-the-Sea and Lytham. These schemes include the provision of a Marine Lake, which has been already made; and there is excellent boating. The construction of the Tramways will greatly aid the further development of these districts, and afford facilities for better communication amongst the residents along the route, so bringing increased traffic to the Company.

The district served by the Tramway is a favourite camping ground for the local Militia and Volunteer Regiments, the line passing the entrance to three Camps—viz., at South Shore, St. Anne's, and Lytham; and it is estimated that during the summer upwards of 10,000 men are in camp. The Tramway will be largely used both by the troops themselves, and also by visitors desiring to see their friends in Camp. The line also passes the Golf Links at St. Anne's-on-the-Sea. The Tramway will, it is anticipated, be largely used by visitors going to, and returning from, the various places of amusement in Blackpool during the evening.

System of Traction.—The system of traction proposed to be adopted (which, so far as the section of the line in the Borough of Blackpool is concerned, is subject to the approval of the Corporation) is the invention of the late Herr Lührig, of Dresden, as improved by Mr. H. P. Holt, of Crossley Brothers, Manchester, the makers of the "Otto" Gas-Engine. The car is self-contained; the motor, which is a two-cylinder "Otto" Gas-Engine specially constructed, being fed with gas from three reservoirs underneath the car. The gas is stored under the low pressure of 8 atmospheres, or 120 lbs. to the square inch; and one charge is enough to run the car from 8 to 10 miles. The manipulation of the car is very simple, consisting of a lever which, according to its position, drives the car either forward or backward, or stops it altogether. There is also a break-lever. The performance of the car is quite satisfactory. It attains easily a speed of 8 miles an hour—the limit allowed by the Board of Trade—and can be stopped by the brakes within its own length.

This system is in operation with the approval of the Board of Trade, upon the Croydon and Thornton Heath Tramways (where it is intended to entirely supersede the horse-cars); and it is specially suitable for this Company, because its adoption makes it possible to reduce working expenses to a minimum, during the period when the traffic is light.

Arrangements have been made with the Traction Syndicate, Limited, of 22, Chancery Lane, London, W.C.—the owners of the patent rights for the United Kingdom—to provide 25 cars, completely equipped for passenger traffic, at a maximum price, including the Gas-Engine, of £700 per car. The cost of the cars will thus not exceed £17,500, *to be satisfied by the issue of fully-paid ordinary shares.*

Cost of Working.—The Traction Syndicate have also agreed to work the line for seven years for the sum of 4½d. per car mile run, with a minimum charge of about 163,000 car miles per annum. The above charge will include: Gas used; Drivers' Wages; Repairs of Cars and Engines; and all other Working Expenses, including the provision of the necessary plant for compressing the gas, and effecting repairs. The Tramway Company have to provide the conductors and inspectors, and the necessary buildings to house the cars and compressing-plant.

The agreement with the Traction Syndicate provides for the purchase by the Tramway Company, after the 24th August, 1902, of the compressing-plant, at a valuation, on twelve months' notice being given by either party; and thereupon the Tramway Company have power to work the line and adopt and use the Syndicate's system, and all patent rights on payment of such royalty as may be mutually agreed upon.

The Parliamentary estimate for laying the line was £52,038 16s. 3d. The Special Act of Parliament, however, gives power to the Corporation of Blackpool to construct the section of line within the Borough, subject to the right of this Company to take a lease on the terms set forth in the form of lease scheduled to the Act. The Corporation of Blackpool have decided to exercise this power, which will reduce the capital expenditure of this Company by £18,289 15s. 4d.—the estimated cost of the construction of so much of the line as is within the Borough boundary.

Capital Required.—The Capital required is as follows:—

Cost of Laying the Line, Erection of Sheds, Depôts, and Offices	£41,500
The Traction Syndicate, for Cars as above	17,500
Parliamentary and Engineering Expenses in connection with obtaining the Act, and Expenses in connection with the formation of the Company up to allotment	8,000
Working Capital	1,500
Total Capital proposed to be issued	£68,500
Deduct—Portion thereof payable, in Shares, for Cars and Parliamentary Expenses	18,500
Capital to be raised	£50,000

The Parliamentary Powers obtained under the Act are considered very advantageous. The whole of the negotiations with the various Local Authorities as to the laying of the line, including the details of construction, have been satisfactorily arranged, and have, where necessary, received the sanction of the Board of Trade. The construction of the line can be proceeded with immediately the capital is subscribed; and it is anticipated that it will be ready for traffic by Easter, 1895.

Estimate of Revenue.—For the purpose of arriving at an estimate of the probable revenue which will be earned, it has been assumed that 25 cars, or their equivalent, will be run four times each way during the day from 9 a.m. to 9 p.m.; being at the average rate of one car every 7½ minutes. The return journey is 15½ miles. It has also been estimated that the cars will, on each journey, carry 16 out of a possible 40 passengers, and that this result will be obtained on 120 days during the year. On this basis, the total car mileage run during the 120 days will be 186,000; and the receipts, at 1d. per mile as allowed by the Act, will yield a total revenue of £12,400

Deduct—For reduction of fares below the Parliamentary limit of 1d. per mile 2,000

£10,400

In addition to the through traffic, a considerable amount of local traffic may reasonably be expected during the season, on a line of this nature, nearly 8 miles long. It has been considered that this might safely be put down as 24 passengers per single journey, travelling one penny stage only. This would yield during the season 2,400

A total revenue from passengers *for the season of 120 days* £12,800

Add estimated revenue from carriage of parcels, and advertising 500

Total estimated revenue £13,300

Working Expenses.—*Less* Management and Working Expenses *for the whole year*:—

Wages and Salaries	£1,200	
Office Expenses, Rates and Taxes, Renewal of Cars and Engines, Repairs of Permanent Way, &c.	2,000	
[*Memo.*—The Repairs of the Cars and Engines, and the Wages of Drivers and Cleaners, will, as mentioned above, be borne by the Traction Syndicate.]		
Rent payable to the Blackpool Corporation in respect of section of Tramway, say	1,440	
Traction Syndicate — Mileage on 186,000 car-miles, at 4½d. per car-mile	3,487	
Sinking Fund, to provide (say) £10,000 at the end of 21 years, to cover loss contingent on the possible purchase by the Local Authorities at the end of that period. The Annual Instalment, invested at 3 per cent., will be	350	
		8,477
Leaving an estimated net annual profit of		£4,823

Equivalent to a Dividend of 7 per cent. upon the above Capital of £68,500.

It will be noticed that, although the expenses enumerated above provide for twelve months' working, the revenue is derived from the *Summer* traffic only, leaving out of account any receipts from local traffic during the remainder of the year, and from visitors to the district during the early spring and the month of October.

The above estimates of traffic and expenditure are put down merely to give intending investors an idea of the volume of traffic required to pay a Dividend of 7 per cent. upon the total Capital.

Contracts.—The following Contracts have been entered into:—

An Agreement dated the Fourth day of September, 1894, and made between CHARLES CHADWELL and another of the one part, and the Company of the other part.

An Agreement of even date with the above, and made between the Company of the one part, and THE TRACTION SYNDICATE, LIMITED, of the other part.

The above Agreements, and the Special Act of Parliament incorporating the Company, can be inspected at the Offices of the Solicitors to the Company.

It is intended to apply for an official quotation upon the Manchester Stock Exchange.

Application for Shares should be made on the form accompanying Prospectus, and sent with the deposit to the Bankers named on the Prospectus.

Prospectuses and Forms of Application may be obtained at the Offices of the Company, and from the Bankers, Brokers, Solicitors, and Auditors of the Company.

In every case where no allotment is made, the deposit will be repaid in full; and where the Shares allotted are less than the number applied for, the surplus will be credited in reduction of the amount payable on allotment.

COMMERCIAL GAS COMPANY.

NOTICE is Hereby Given, that an ORDINARY MEETING of the Commercial Gas Company will be holden at the Cannon Street Hotel, in the City of London, on Thursday, the 4th of October, 1894, at Twelve o'clock at Noon, to receive the Report of the Directors, to declare a Dividend, and for other Business.

The Stock Transfer Books will be closed from the 21st of September inst., to the 4th of October next, both days inclusive.

By order of the Board,
H. D. ELLIS,
Secretary.

Offices: Stepney,
Sept. 11, 1894.

SWANSEA, GLAMORGANSHIRE.

IMPORTANT SALE OF SWANSEA GAS SHARES.

MESSRS. JOHN M. LEEDER & SON will offer for SALE by PUBLIC AUCTION (pursuant to the provisions of "The Swansea Gas Order, 1888") at the Mackworth Arms Hotel, Wind Street, Swansea, on Friday, Oct. 5, 1894, at half-past Two o'clock precisely, 400 New Ordinary Seven per Cent. SHARES, 1888, of £25 each, in the SWANSEA GASLIGHT COMPANY; being part of the additional Capital the Company is authorized to raise by the "Swansea Gas Order, 1888."

The Shares will be entitled to Dividend at the rate not exceeding Seven per cent. per annum, and will rank equally in respect thereof as part of the Original Capital of the Company. All the lots will be sold with the right to Dividend accruing as from the 1st day of October, 1894. The Company have for many years paid full maximum Dividends and they have a large Reserve Fund which is available for maintaining such Dividends.

For full Particulars and Conditions of Sale, apply to Mr. THORNTON ANDREWS, Secretary, Gas-Works, SWANSEA, or to the AUCTIONEERS, at their Offices, Goat Street, SWANSEA.

Price 2s. per dozen, or 10s. 6d. per 100, post free.

CONSPIRACY and Protection of Property Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

*** *The Act extends to Scotland and Ireland.*

MICHAEL AND WILL ON GAS AND WATER.
This Day is published in One Vol., Royal 8vo., 32s. Cloth.

The Law of Gas, Water, & Electric Lighting.

Fourth Edition.
Re-written and brought down to date,
By J. SHIRESS WILL, Q.C.

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Output about 3000 tons per day.

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Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
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YIELD OF GAS PER TON · 10,375 CUBIC FEET.
ILLUMINATING POWER · 17·50 SPERM CANDLES.
COKE · · · · · · · 75 PER CENT.

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Yield of Coke: 13½ cwt.
Illuminating Power of Gas, average of a series of tests, **17 Sperm Candles.**
The Coke was of excellent quality.

The following is a complete ultimate Analysis of the Coal.

	Per Cent.
Carbon	83·128
Hydrogen	5·116
Oxygen	7·401
Nitrogen	0·585
Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke.

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
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I am, Gentlemen,
Yours truly,
A. B. COWAN,
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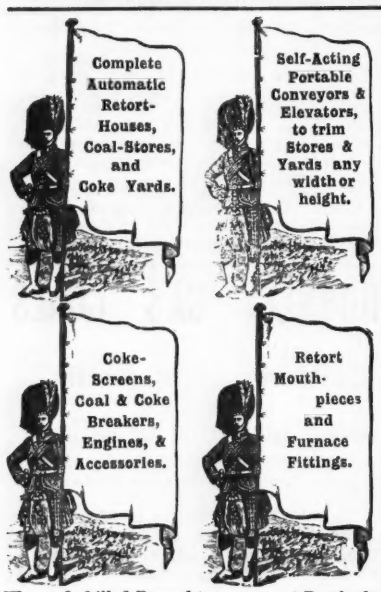
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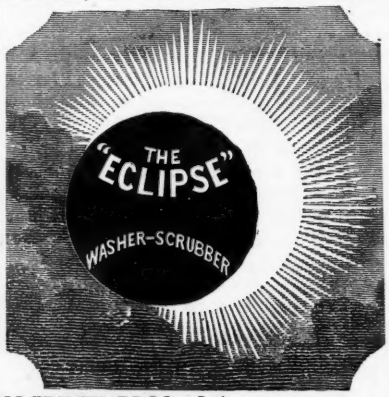
SEE ADVT., p. 540 OF LAST WEEK'S JOURNAL; ALSO END PAGE OF NEXT ISSUE.



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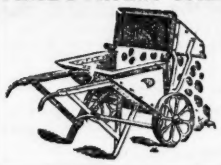

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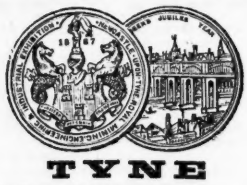

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Illuminating Power	38·22 candles.
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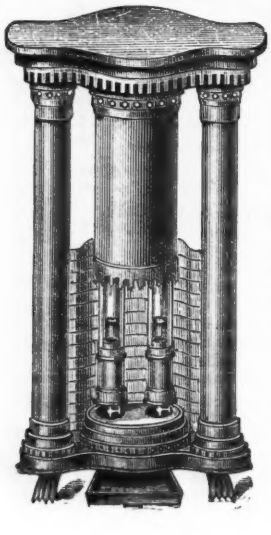

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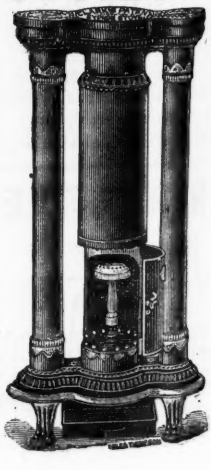

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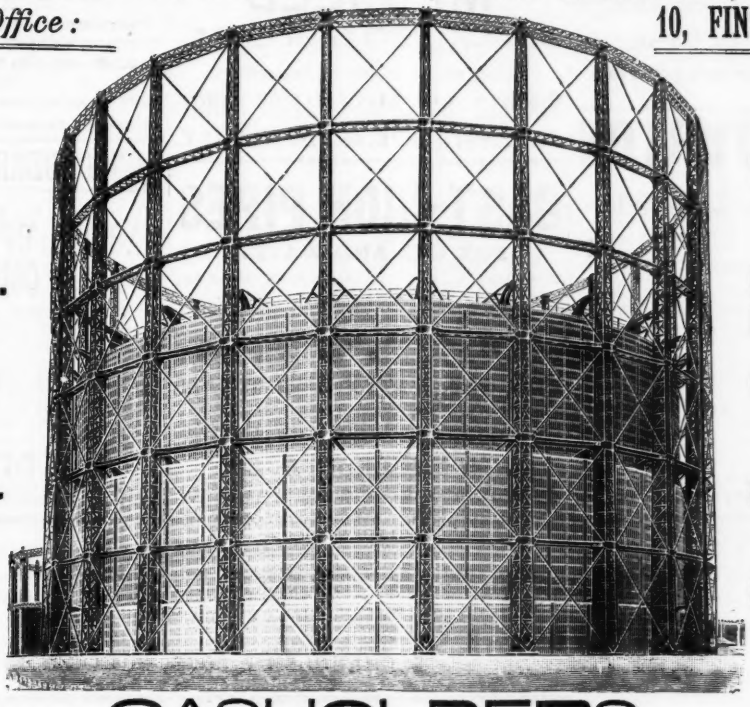

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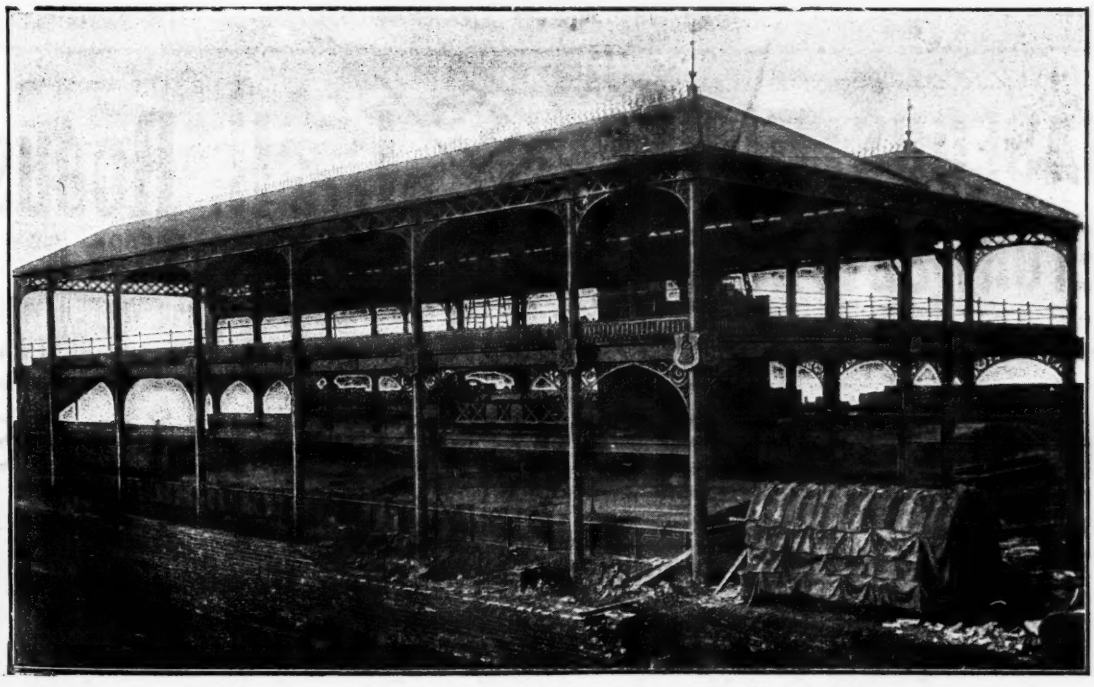

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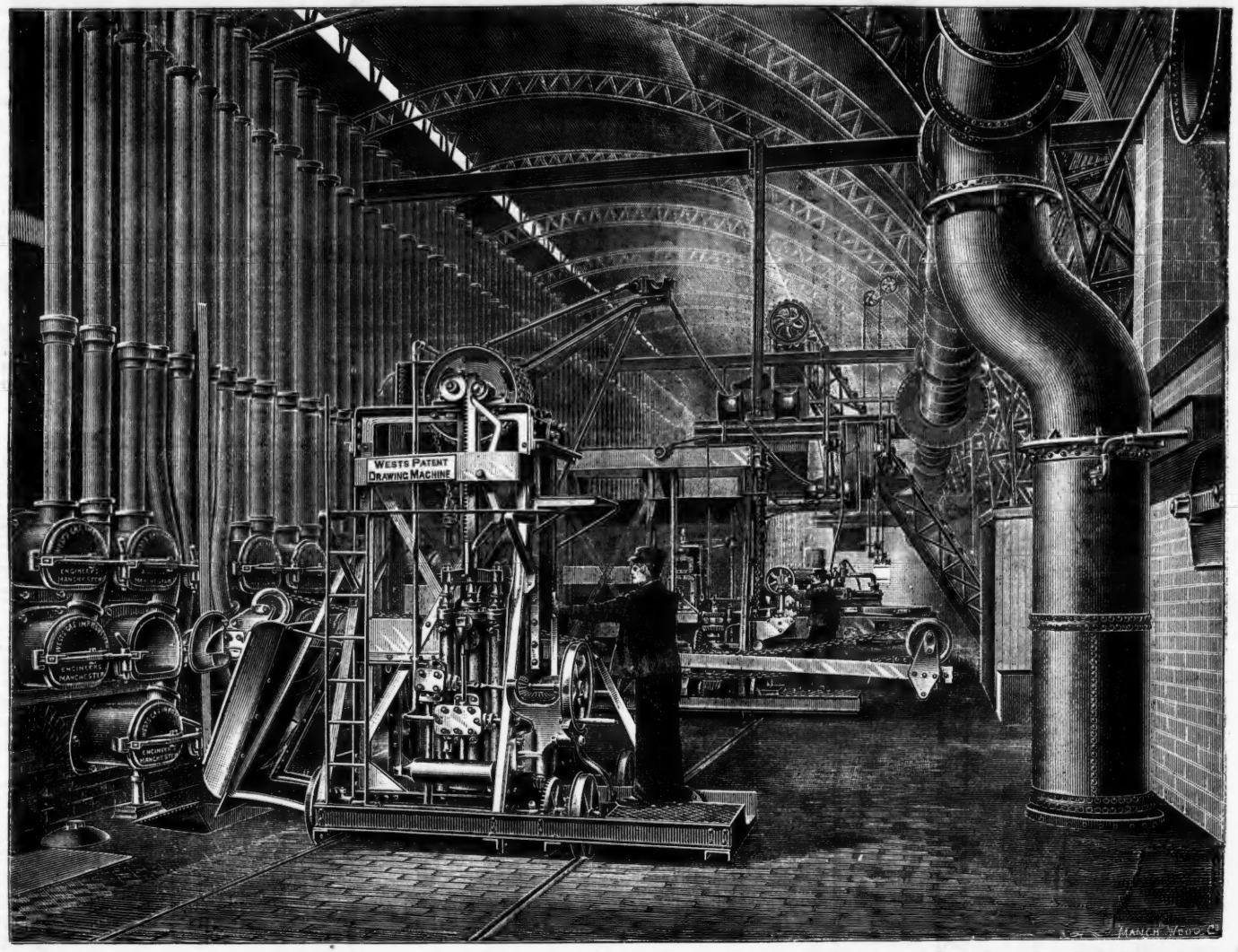

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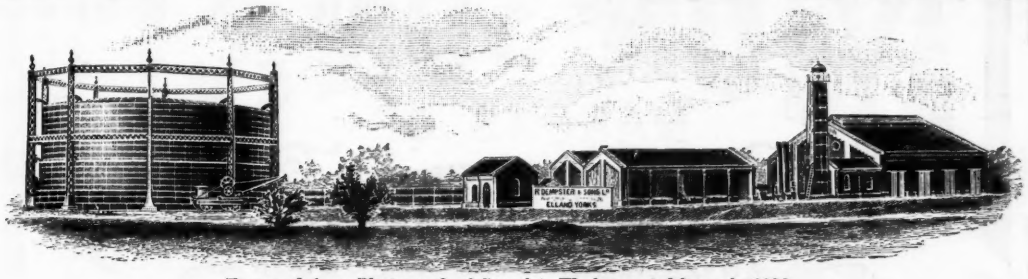

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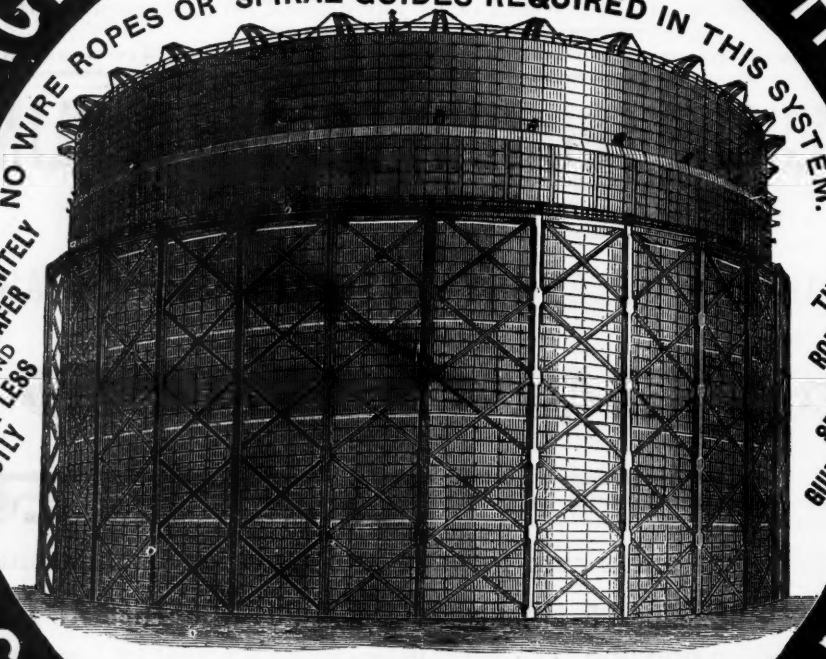

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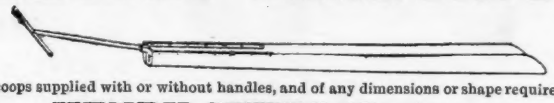

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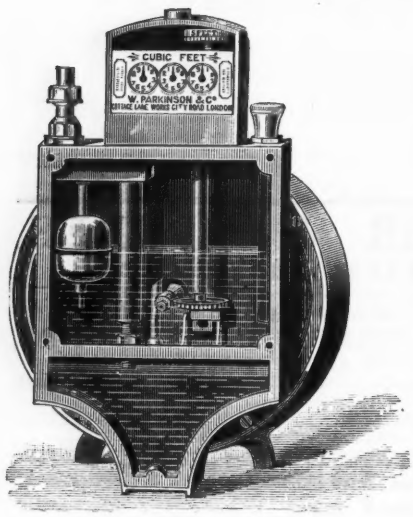

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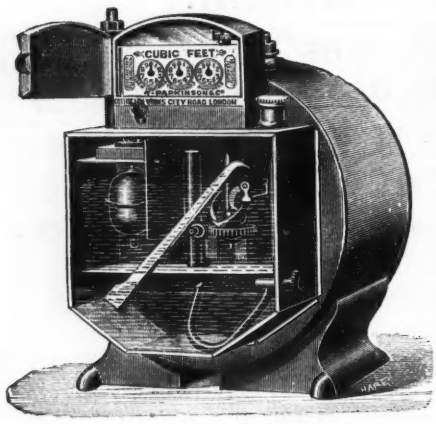

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[See Advt. p. 548.

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